LONGMANS' REGIONAL
GEOGRAPHIES OF INDIA

THE INDIAN EMPIRE

PART I. NORTH-EAST INDIA

F. G. FRENCH
AND
L. DUDLEY STAMP

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A. M. M'S HIGH SCHOOL
BANGALORE

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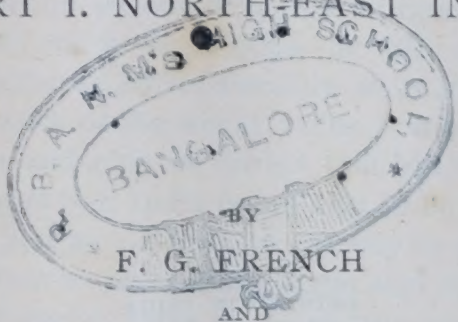

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PREFACE

THIS book is the second of a series embracing the whole of India and Burma. Like its predecessor (*A Geography of Burma for Schools*) it has been written with two objects in view. A prime essential in the equipment of every educated person is a knowledge of his own country and an appreciation of its relationship with other countries in the life and work of the world. The first book aimed at giving the boys and girls of Burma that instruction. The authors considered that India is too vast to be treated as a whole, for it is just as difficult for the boy or girl living in the Gangetic Plain to picture life in the arid north-west or the hills of Peninsular India as to picture conditions in a foreign country. The present book is therefore divided into two very distinct parts. The first part aims at imparting a knowledge of that part of India which to the boy living in the north-east may be called 'his own country'; the second part will extend the principles learnt in the first part to the whole of India and indicates the relationship between India and the world beyond. To quote the 'Rules and Orders of the Education Department, Bengal':—'Pupils will at first be occupied with a stage of the subject ("Home" geography) in which it is possible for them to get their knowledge, or at any rate to have it illustrated, largely at first-hand. The transition will then have to be made to the stage ("World" geography) in which they will have to make use of their imagination. They will have to apply standards with which they will have become gradually familiar, and principles derived from a study of their immediate surroundings to larger and larger areas.'

The second object which has been kept in mind is that of presenting the matter in such a way as will, it is hoped,

afford the teacher every possible help in his lessons, so that he may feel assured that his pupils thoroughly understand the great fundamental principles underlying the study of geography as exemplified in the study of North-eastern India.

The general plan of each of the first nine chapters is the same—a simple introduction to the main geographical principle involved followed by a study of how that principle works in North-eastern India. Chapters X to XIX treat in detail each Natural Region. Here the teacher may, if so desired, select first those which fall within the Province in which the school is situated. The chapter devoted to Political Divisions will assist in this respect. These are followed by a chapter on Communications which serves to link up what has gone before. The last chapter of Part I sums up the whole by a study of local trade, including foreign trade from the area studied. Part II, where the whole of India is treated, will then follow on naturally, but if the teacher has omitted any of the Chapters X to XIX they should be taken before Part II or during the work of Part II.

A word is necessary on the exercises at the end of each chapter. Help for both teacher and pupil has been the great consideration in the wording and arrangement of every paragraph in the book and all the teaching devices of proved value have been enlisted in this cause ; simplicity of presentation (by no means an easy task in the case of many important geographical principles), maps, diagrams, comparisons, and homely illustrations—every aid which has proved of use in the actual teaching of the subject has been included. But it is not possible to put every question that the teacher must ask his pupils, or to give every exercise possible and necessary for a thorough 'driving home' of every point. Therefore the exercises are meant to serve as guides only. The teacher should draw up at least twenty

more exercises on each chapter similar to those given. Original exercises are the life and soul of good teaching, and the study of geography offers a most delightful field for this work. Questions which demand merely a reproduction of the text are deadly dull and unprofitable, and mark the teacher who sets them as a failure. Original exercises are a pleasure to the teacher who invents them, and a source of delight to the pupils who solve them.

This volume follows the scheme originally drawn up by one of us (F.G.F.), elaborated and used by both of us in the volume for Burma, but the present work has been written mainly by one of us (L.D.S.) who must be considered responsible for the facts therein. The work is based almost entirely on Official Publications, especially Census Reports and Annual Reports on Rainfall, Agriculture, Irrigation, Railways, Sea-Borne Trade, Commerce, etc., published by the Government of India and some Provincial Governments. The authors wish, however, to record their indebtedness to O'Malley's 'Bengal, Bihar, Orissa, Sikkim' (*Provincial Geographies of India*).

Finally, the book contains nothing which is beyond the comprehension of Middle School pupils. Special attention has been paid to the requirements of the various Middle School Syllabuses in the Provinces of Bengal, Bihar and Orissa, United Provinces and Assam, and every attempt has been made to include all information on the Province and India required by the varied curricula in the different Provinces.

Rangoon, 1925. L. D. S.

Important Note: The Part II referred to in the above Preface and which forms the continuation of the work in the present book is now entitled 'Longmans' Regional Geographies of India: The Indian Empire, Part IV, The whole of India.'

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FIG. 1.—Map of the World, showing the British Empire in black. The principal steamer-lines from Rangoon to other parts of the world are shown, and the number of days' sailing for each stage of the journey. An average rate for a modern steamer is 300 miles a day.

A Geography of North-Eastern India for Schools

CHAPTER I

POSITION AND SIZE

1. A number of the countries of the world are joined together into one great family. Counting the little ones and the big ones, there are about thirty members in this family, and India is one of them. The name of the family is ' The British Empire ', or ' The British Commonwealth of Nations.' It is the largest Empire the world has ever seen.

The oldest member of the Empire, the British Isles, is not situated in the middle of it. India is much nearer the middle of the Empire, for there is only one important part of it, Canada, which is very far away from India. Look at Fig. 1 and you will see that it is quite easy to leave this country in a steamer and reach China, Africa, or Australia.

Fig. 2 shows the size of India compared with that of other countries in the British Empire. The part of India we are going to study in this book is rather less than a quarter of the whole. The area of India is 1,800,000 square miles ; the part we are studying is 380,000 square miles. From Delhi to the east of Assam is 1,200 miles, from Puri to Mount Everest is 600 miles. These figures will help you to realize the size of the country. This part of India is divided by Government into the Provinces of Assam, Bengal, Bihar and Orissa and the United Provinces. We are going to study, then, your own province and the surrounding regions.

2. Look in your atlas and find a map with the Tropics of Cancer and Capricorn marked. Cancer passes through India, therefore this country is partly in the Temperate Zone and partly in the Torrid Zone. Which part is in the

Torrid Zone? All places in the Torrid Zone are not equally hot. Port Blair and Calcutta are both in this zone, but Port Blair is hotter than Calcutta. On Fig. 1 a thick black line is drawn. All the countries marked inside that line are the hottest countries in the world. Notice that North-eastern India which we are now going to study is not quite

FIG. 2.—The different countries of the British Empire, showing their comparative sizes.

inside the line, but is very nearly inside it. Ours is, therefore, a very warm country.

3. On every map lines of latitude are marked to tell us how far a place is north or south of the Equator. The North and South Poles are farther away from the Equator than any other places. They are ninety degrees away, and you could not go farther than that. Calcutta is twenty-two degrees north from the Equator, that is, in latitude 22° N. Delhi is in latitude 28° N. Places on the Tropic of Cancer are in latitude 23½° N. Thus we see that a large part of the country lies north of the Tropic of Cancer. This is a very important fact, for it means that in all places in North-eastern India south of Dacca the sun is almost overhead at twelve o'clock noon every day for half the year, and that it is exactly overhead on two occasions. Now a place which is directly under the sun gets more heat than a place which is sloping away from the sun. If you wished to fill a bucket with rain water during a heavy storm, you would

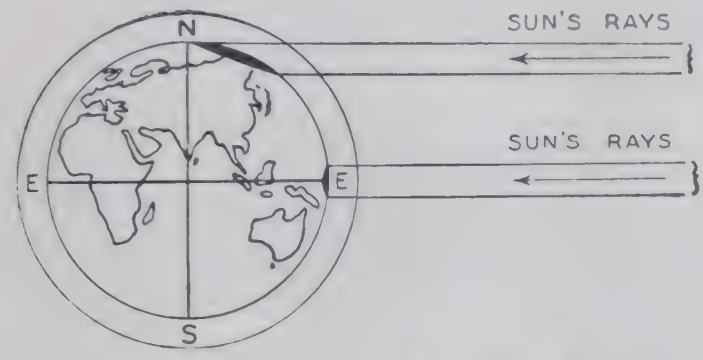

FIG. 3.—Diagram showing that at the Poles the sun's rays are spread out over a large area and cannot make the earth so warm as in the Tropics.

stand it upright on the ground so as to catch as much water as possible. If you allowed your bucket to stand in a sloping position, it would not collect the same amount of water. In the same way, heat is being poured on to the earth from the sun, and the places which are directly beneath the sun receive the greater amount of heat. You will see this illustrated in Fig. 3, and this explains why North-eastern India is a hot country.

4. On every map lines of longitude are marked to tell us how far any place is east or west of Greenwich in England. The line of longitude which passes through

Greenwich is marked 0 degree. Lines to the east of this towards India and China are marked with figures up to 180 degrees, and lines to the west of Greenwich, towards America, are marked up to 180 degrees. Calcutta and Darjeeling are both longitude 88 degrees east of Greenwich, or, as we generally write it, long. 88° E.

Now since the world turns completely round from west to east once in twenty-four hours, the 180 degrees east of Greenwich and the 180 degrees west of Greenwich, or 360 degrees in all, pass the sun in that time. That is, the difference in time between places one degree away from each other is four minutes. Work the sum for yourself—twenty-four hours divided by 360. As the earth turns from west to east, India faces the sun sooner than Greenwich faces it. As Calcutta and Darjeeling are 88 degrees east, they pass the sun 88 × 4 minutes earlier than Greenwich in England. Thus, when it is six in the morning in Calcutta, it is just after midnight in London.

5. Now let us turn to Fig. 14, which is a map of North-eastern India. The scale of the map is given at the bottom. It is 2/5 inch to hundred miles. That is every time you measure 2/5 of an inch with your ruler, you have measured 100 miles. Measure the distance between Calcutta and Delhi. It is really 800 miles. Do you get this answer? Now measure the distance between Calcutta and Benares and the distance between Calcutta and Darjeeling.

6. Trace the map in Fig. 5 on to squared graph paper. You can do this by putting a piece of carbon paper beneath it and using a pointed piece of bamboo. Count the number of squares on the graph paper covered by your traced map of North-eastern India. Measure the length of the side of one square. Perhaps it measures $\frac{1}{10}$ inch. Thus, since one inch represents 250 miles on the map, $\frac{1}{10}$ inch means 25 miles, and the amount of the country covered by each square on the graph paper is 625 square miles. Now you can discover what is the area of North-eastern India, including Assam, Bengal, Bihar, Orissa and the United Provinces. Discover the area of each province in the same way. If the squares on your paper are not quarter inch, but another size, you can still work out the area of the country in this way.

QUESTIONS AND EXERCISES

1. Name the ten largest countries in the British Empire, arranging them in order of size.

2. What parts of India are in the Temperate Zone? Name three places which are just on the border between the Torrid Zone and the Temperate Zone in North-eastern India.

3. Trace a map of Bengal on to square paper. What area of Bengal is in the Torrid Zone?

4. Where does the sun rise earlier, at Delhi or Dacca? Why?

5. Name the parts of the Empire shown in Fig. 1, and the races of people who inhabit each part. Make a table like the following :—

Country	People	How to get there	How long it takes to get there

6. Place a globe in the sunshine so that the sun shines directly on the Equator of the Globe, after a few minutes you will be able to feel with your hand that the Equator of the Globe has received much more heat than the Poles.

CHAPTER II

PHYSICAL FEATURES

1. Fig. 4 is a picture of what North-eastern India would look like to a man flying over the country in an aeroplane. He would be able to fly long distances and see nothing but flat land covered with paddy fields or with wheat fields. In other places he would see great ranges of mountains so high that he would have to turn back because he could not fly over them. The main mountain ranges and valleys of our country are very simply arranged and easy for you to understand.

In the far north is the great mountain wall formed by the Himalaya Mountains. This wall is over three miles high and some of the highest parts of it are five and a half miles high. One of the highest peaks is Mount Everest and although many have tried no one has yet been able to climb to the top of it. On the other side of this mountain wall is a great plateau, the highest plateau in the world. It is so high that it is sometimes called 'the Roof of the World'. So you see our country is quite cut off from the north. There is one narrow gate-way in the wall, and through it rushes the great Brahmaputra River.

In the east there is another mountain wall which cuts off our country from Burma. It consists not of one range of mountains but of several ranges. It is not so high as the Himalayas but is still very difficult to cross. If we want to go from Assam to Burma we do not cross this wall but we go to Calcutta and then to Burma by sea. Notice from Fig. 4 that the mountain wall is at first running north and south but as we follow it northwards into Assam it swings round into a north-easterly direction and runs parallel to the Himalayas. Between the Himalayas and the Eastern Mountain Wall in Assam is the valley of the Brahmaputra. Look again at Fig. 5 and notice that there is a branch from the Eastern Mountains jutting out into the plains and forming the Khasi and Garo Hills in Assam.

FIG. 4.—Photo-Relief map of North-Eastern India.

2. In the south-west of the part of India we are studying, we notice there is large area of land which does not consist of high mountains but is a broad area of high land with a flat top. This is a plateau or a table-land. It is called a table-land because it is raised up from the low land but has a top nearly flat like a table. Except where it has been cut into by rivers it is about 2,000 or 2,500 feet above the level of the sea. This table-land we called the Chota Nagpur Plateau. It is part of the much larger table-land which stretches all over that part of India called 'Peninsular India'.

Between the Plateau of Central India and the great Northern Wall formed by the Himalaya Mountains, there is a very broad flat valley, the Valley of the Ganges. This valley is one of the most important, the most fertile and the most thickly populated in the world. The River Ganges slopes very very gently towards the sea. One thousand miles from the mouth the surface of the water is only 500 feet above the level of the sea so that the river only drops eight inches in each mile. Notice from the map, Fig. 4 or 5, that the Ganges bends sharply round the corner of the Chota Nagpur Plateau and the Brahmaputra bends sharply round the corner of the Garo Hills. A little lower both rivers join and have built up a very large delta.

If we follow right up the Ganges Valley we come to Delhi and then we cross over a very low divide and find all the rivers are flowing to the west to join the Indus. To the north-west of our area there is no barrier or mountain wall—we can travel very easily from the Valley of the Ganges to the Valley of the Indus. In past ages as you learn in your history many peoples have invaded India and have come from the north-west. They travelled along the Valley of the Indus past Delhi into the rich fertile Valley of the Ganges. The people could not go to the north because there is the great Mountain Wall, they did not go to the south because there is the Plateau of Central India where travelling is more difficult and the land much less fertile. It is because Delhi stands in such an important position between the two valleys that it has been made the Capital of India.

There is only one other fact about the physical features of our country we must notice. Between the Chota

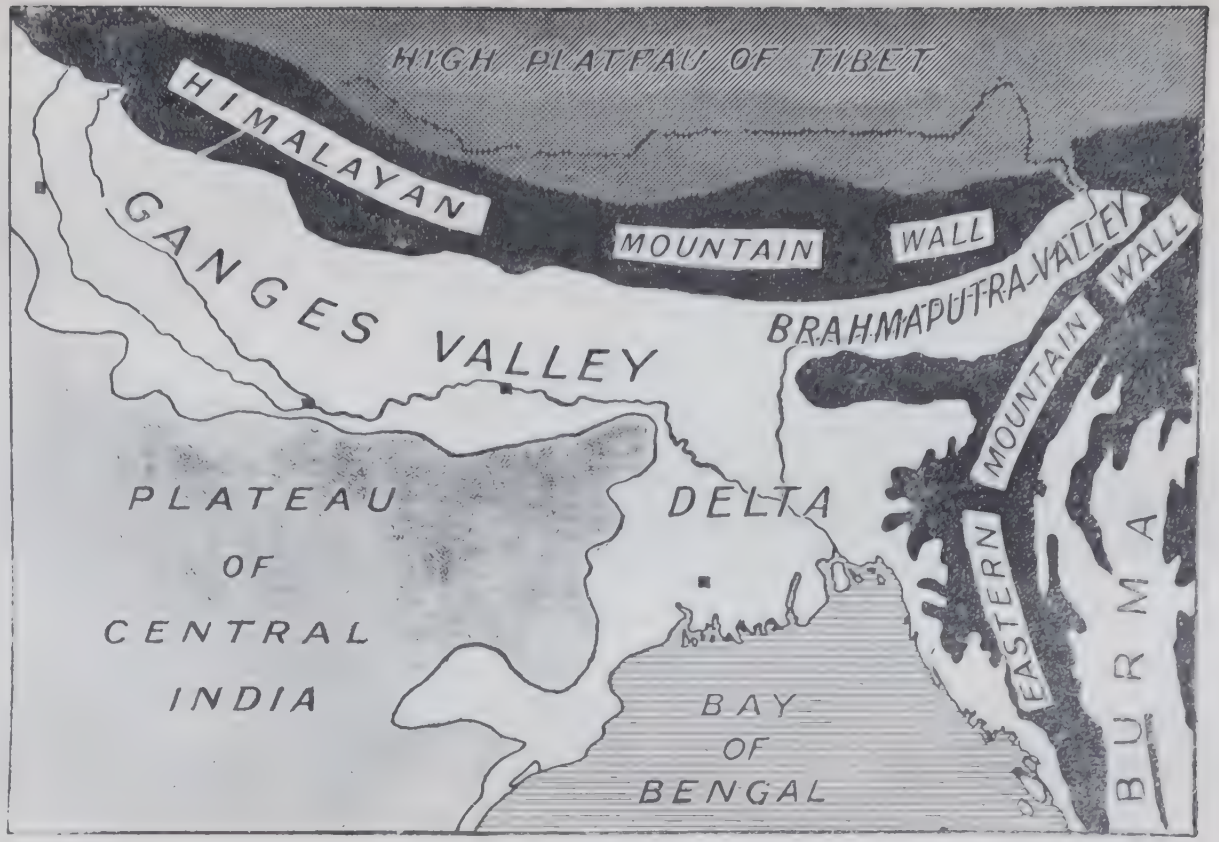

FIG. 5 —A sketch-map to show mountain ranges and valleys.

Nagpur Plateau and the sea there is a narrow strip of low land—a coastal plain.

3. It will help us to realize still more clearly where the hills and mountains of North-eastern India are if we imagine the sea has risen 1,000 feet—that is four or five times as high as the tallest building you can think of. If this could be, our country would look like Fig. 7. Compare this with Fig. 6 which is North-eastern India as it actually is.

In Fig. 7, notice the Himalayas in the north, the eastern mountains on the borders of Burma, the Khasi and Garo Hills now looking like a long peninsula and the Chota Nagpur Plateau in the south-west.

Turn now to Fig. 8. Here all the land more than 1,000 feet above the level of the sea is dotted. If the sea could rise still higher—if it could rise 3,000 feet, India would be nothing but a great mass of mountains in the north and strings of islands. Those parts which are shown black on Fig. 8 would be the only land to be seen. Fig. 8 is called a contour map, that is, a map with lines (contour lines) drawn on it to show the parts of a country which have the same height. In this case the lines show those parts of North-eastern India which are higher than 1,000 feet above the sea, and those higher than 3,000 feet. The lines are called the 1,000-feet and 3,000-feet contour-lines. If you look in your atlas you will find a contour map of India, but it will be coloured in green, light brown and dark brown, to make the divisions of different heights show up more clearly.

4. The ranges of mountains in India are part of the greater mountain ranges of Asia. If you look in your atlas at a physical map of Asia you will see that the whole of the central part of Asia forms a great plateau more than 3,000 feet in height. That part which lies north of India is more than 12,000 feet high. Notice from your atlas also that there are several lines of mountains which start in Europe—where they form the Alps, Carpathians, Caucasus and other ranges—which continue into Asia and join up as a knot of land over three miles high, to the north-west of India. This knot of land is called the Pamir Plateau. From there eastwards run the Himalayas—the highest range of mountains in the world. The eastern

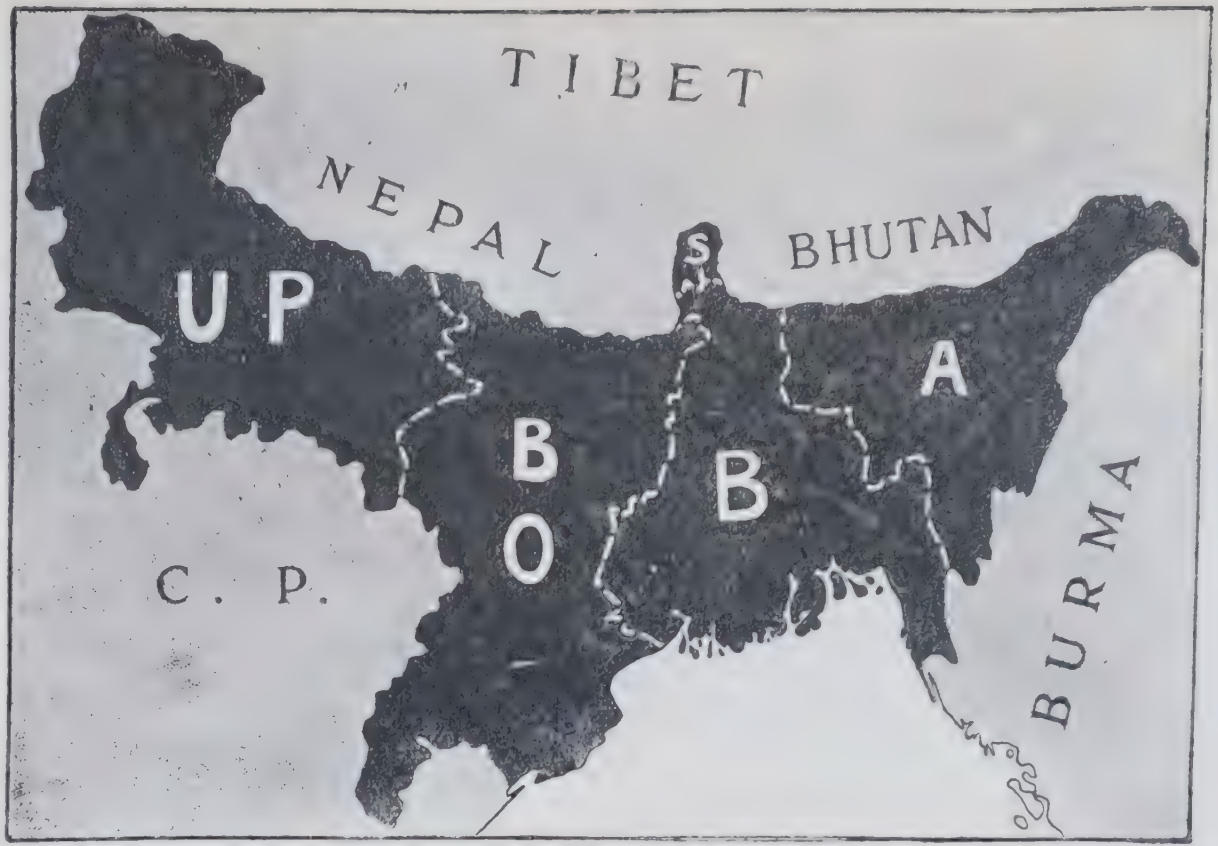

FIG. 6.—North-Eastern India as it is. All land black.

FIG. 7.—North-Eastern India as it would look if the sea rose 1,000 feet.

end of the Himalaya Mountains joins up with the mountains of the northern part of Burma. From there one great line runs south-westwards and then south as the Arakan Yoma. This line is interrupted by the sea at Cape Negrais, but continues through the Andaman and Nicobar Islands into Sumatra, Java and New Guinea. Fig. 9 shows these features.

5. Notice from Fig. 4 or 5 that it is difficult to get to the sea from the districts of North-eastern India, except by way of the mouths of the Ganges and Brahmaputra. Many of the inhabitants of Assam or the Ganges Valley have never seen the sea. It also explains why the inhabitants do not go to sea to earn their living as sailors. Look at a map of the British Isles. Put your pencil anywhere you choose on that map and you will see that the sea is not very far away; either there is a big bay near or the sea enters a wide river mouth, and so reaches the heart of the land. This explains why English people like the sea and why many of them are sailors. In India the people who go to sea are those who live near the sea—as on the Chittagong Coast or the Delta region of Bengal. Similarly the people who live in Norway and the Japanese are good sailors, while the Russians and Egyptians are not. Examine the maps of their countries and say why it should be so.

6. Let us go back and learn a little more about the rivers of North-eastern India.

Look again at Fig. 8 and notice that the Brahmaputra flows in a comparatively narrow valley. It is fed by the snows of the Tibetan Plateau. The rivers which flow into it from the hills of Assam and the Himalaya Mountains are only short rushing torrents. The Brahmaputra passes out of its valley into the broad delta plains before it is joined by the Ganges. Before they reach the sea the two rivers, now called the Padma, receive the Meghna. This river flows down from the Khasi and Garo Hills which have almost the heaviest rainfall in the world.

The Ganges Valley is very different. It is very flat and broad and the Ganges has many big tributaries, which wind about and flow for great distances before joining the main river. On the north side are the Gogra and Rapti and Buri Gandak flowing down from the Himalayas; on the south

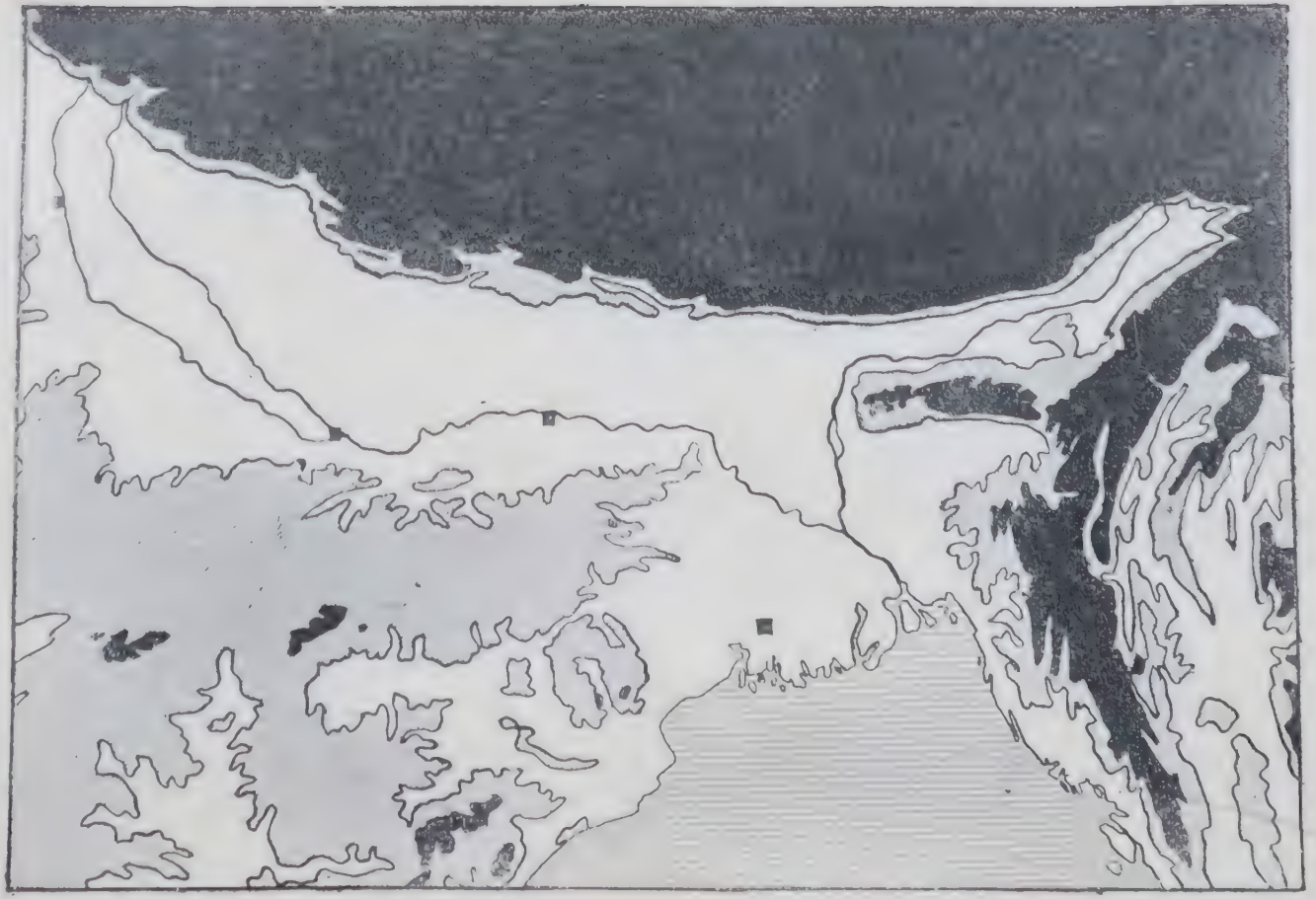

FIG. 8.—Contour or physical map of North-Eastern India. Land over 3,000 feet, black; land 1,000 to 3,000 feet, dotted; land below 1,000 feet, white.

side the Son and other rivers flowing from the great plateau of Central India. The great tributary, the River Jumna, rises in the Himalayas further west than the Ganges which it joins at Allahabad. You will learn in a later chapter about the 'dead and dying rivers' of the great delta.

The Chota Nagpur Plateau is drained by many small rivers which flow directly into the sea. In the southern

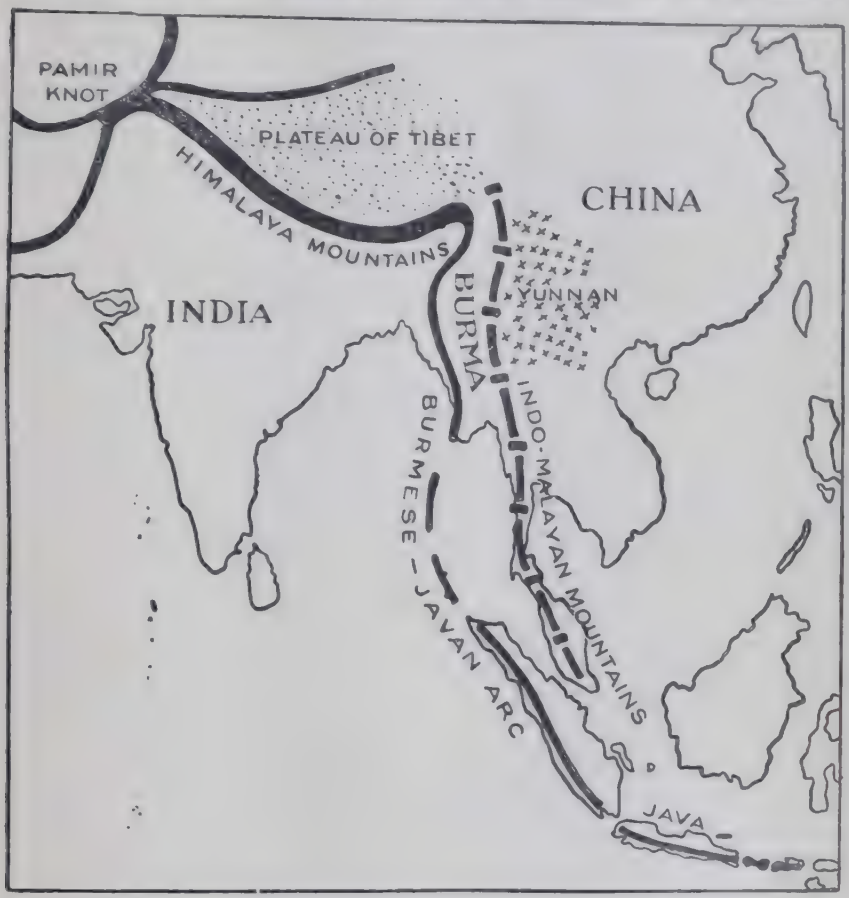

FIG. 9.—The mountains of South-Eastern Asia.

part are many tributaries of the Mahanadi River. This river rises in a dry part of Central India and in the dry season has so little water that it cannot be used by boats.

In part of the Ganges Valley and the Delta the rivers form the chief means of communication. One hundred years ago there was not a road in the whole country and

every one travelled by boat. The first railway was built in 1854. Notice the difference between navigable and unnavigable rivers. Why is the Mahanadi little used by ships? Why are the rivers flowing down from the Chota Nagpur Plateau not used?

QUESTIONS AND EXERCISES

1. Show by sketch-map the position of the mountain wall of North-eastern India.
2. What connexion is there between the mountains of Northern India and other parts of Asia?
3. Describe the course of the most important rivers in North-eastern India (with sketch-maps).
4. What is meant by a contour and a contour map?

CHAPTER III

GEOLOGY AND MINERALS

1. In the last chapter you have learnt that some parts of our country are occupied by rugged mountain ranges, others are broad fertile river valleys, whilst still other parts are rolling plateaux or table-lands. Now, why should this be so? The answer to that is, it is the work of rain and rivers. We will now see how rain and rivers have altered the surface of the country. During the rainy season you have seen the rain-drops pattering on the road and running together to form little streams which carve beds or little valleys for themselves out of the dust and mud. The first action of a river is exactly like that. The river carves out its bed and makes it deeper, so that a section across its first little valley is shaped like diagram A in Fig. 10. At the same time as this is going on the rain is falling in the valley, and the steep edges of the river banks are broken off and fall into the stream, which carries the soil away. In this way, the river valley is widened and takes on the shape shown in diagrams B and C in Fig. 10. Then you must remember that the stream does not flow quite straight. The water swings from side to side and helps to make the valley broader. Gradually the river

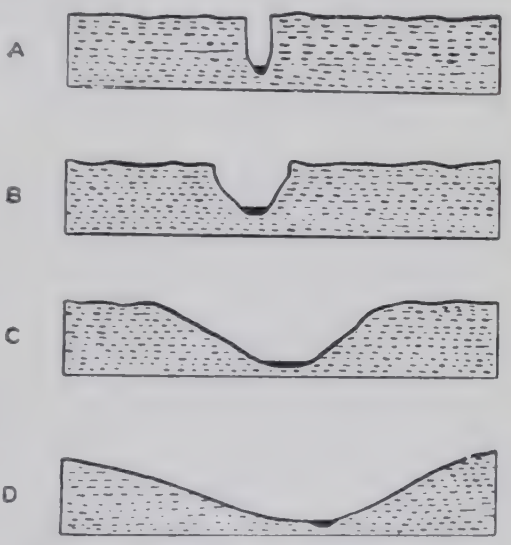

FIG. 10.—Diagram of river valleys.

carves out for itself a broad, flat-bottomed valley, shaped in section like diagram D in Fig. 10.

Now the rain and rivers will eat away the land much more easily and quickly where the soil is soft than where the soil is rocky and hard. So in India we find that where the rocks are hard they have been left to form the hills and mountains, but the soft parts have been washed away and the broad river valleys formed.

Before we leave the rivers there is something else to notice. If you have looked at the rivers of North-eastern India, such as the Ganges, you will remember that the water is always muddy. This mud is the fine dust and clay which the rain washed out of the soil in some distant region, and which the river has carried along for great distances. When the river is in flood, that is, at the high-water season, it spreads over part of its banks and some of the mud is spread over the ground. But most of the mud is carried along by the river till it reaches the sea. There the mud is dropped by the river so that the shallow sea at the mouth of the river is filled up and a piece is added to the dry land. This is how the great delta of the Ganges and Brahmaputra has been formed. The fine mud dropped by the river makes very fertile soil, especially for paddy. The soil is called alluvium. So we find stretches of alluvium on each side of the courses of great rivers as well as making up their delta.

2. Perhaps you are wondering why the rocks in some parts of India should be hard and in other parts soft. The study which teaches us about the stones of the earth's crust and the changes which take place on its surface is called geology. We do not know very much about the inside of the earth. We know that it is very heavy and is probably almost a solid mass of iron. The part of the earth we can see is the earth's crust—all the mountains, the valleys, the seas and great oceans. The earth is rather like a big round mango, and the crust of the earth is like the skin of the mango. Now the geologist calls all the materials which make up the crust 'rocks.' There are rocks of all kinds, some are soft and some are hard. Rocks are not all of the same age, some are younger than others. Every year the Ganges is bringing down mud and dropping it near its mouth, so that the alluvium of the Ganges or

Brahmaputra is both a very young rock and a very soft one. As a rule, the older the rock the harder it becomes.

We know that when a man goes down into a deep mine, he finds the air and rocks around him getting hotter and hotter. If he were able to go down far enough, it would become much too hot for him to live. Many miles down, in the lower part of the crust or skin of the earth it is so hot that the rocks are sometimes melted. In some parts of the world there are holes or cracks through which the molten rock can come out. We call these holes or cracks volcanoes. The molten rock which comes up is called lava. It is red-hot when it is first poured out, and takes a very long time to cool. Sometimes one volcano is found all alone, at other times there are numbers of them close together in a line. There are no volcanoes in our part of India but there used to be a big solitary one in Central Burma, but now it is dead or, as we say, 'extinct.' This volcano is Mount Popa. The lava which it has poured out has built up a mountain 4000 feet high. In other parts of India, in Bombay Presidency and part of the Central Indian Plateau huge areas of country consist of lava which has been poured out by volcanoes.

3 We have now discovered that there are two very different kinds of rock. There are the layers of mud, sand, and stones which are laid down by rivers, or in the sea, or in lakes, or even the dust which is blown from one place to another by the wind. All these are called Sedimentary Rocks. They are at first soft, but after a long time may become compressed and hard. Then there are the rocks which have been molten and then become solid on cooling. They are called Igneous Rocks. There is one more important kind of rock. Where the sedimentary rocks have been made very hot by being near the big masses of molten rock, or for other reasons, they have been quite changed and are called Metamorphic or Crystalline Rocks. If you live near the Chota Nagpur Plateau most of the hills there consist of this crystalline rock. If you look at it carefully you will see that it consists of shining pieces or 'crystals.' Some of the crystals are white, some are dark.

4. Just like the igneous rocks, nearly all the ores of the valuable and useful metals like gold, silver, lead, zinc, tin

and iron, have their origin deep down in the earth's crust. So it is that we find the important minerals either close to the igneous rocks or else where the rocks are old and full of cracks through which the ores have come up from their place of origin deep down in the earth. Most of the ores came up not as we see them now, but, as we say, 'in solution.' You can make a 'solution' of salt or sugar in water, and similarly, deep down in the earth, the ores of metals form a solution. All this is important, because we find the valuable deposits of ores in the old crystalline or igneous rocks. But as we saw earlier in the chapter, rain and rivers can wear away the land, and sometimes the ores, too, are worn away and carried down into the river valleys. Deposits of ores occurring thus in the river valleys are called alluvial deposits. Precious stones like rubies and diamonds are also closely connected with the older rocks or the igneous rocks.

5. There are two very important substances, however, which always occur in the sedimentary rocks. These are coal and mineral oil. Both of them have really been formed from vegetation—plants which grew in past ages and have been buried by masses of river sediment, and have become changed into coal or oil. Oil occurs in the newer sedimentary rocks as it does in Assam. Coal in India we find in sedimentary rocks round the fringe of the old crystalline rocks, as in Western Bengal. Look at Fig. 11. You will now see that you must not expect to find oil or coal and lead or tin in the same parts of a country.

6 Have you ever been sitting or lying down and then suddenly felt the earth begin to shake? Probably you have, and know that you have felt an earthquake. That will tell you that the crust of the earth is not perfectly still. Probably as a result of the molten igneous rocks moving in the lower parts of the crust, the surface of the ground is not steady, and the rocks become folded or bent. In the course of long ages, small earthquakes and big earthquakes push up some parts of the earth's crust and press other parts down. Also the movements fold the rocks just as you could fold your exercise book if you lay it out on the desk and then press it from either side. In this way big wrinkles are formed on the crust of the earth, just as you can see wrinkles on the skin of some mangoes. When sedimentary

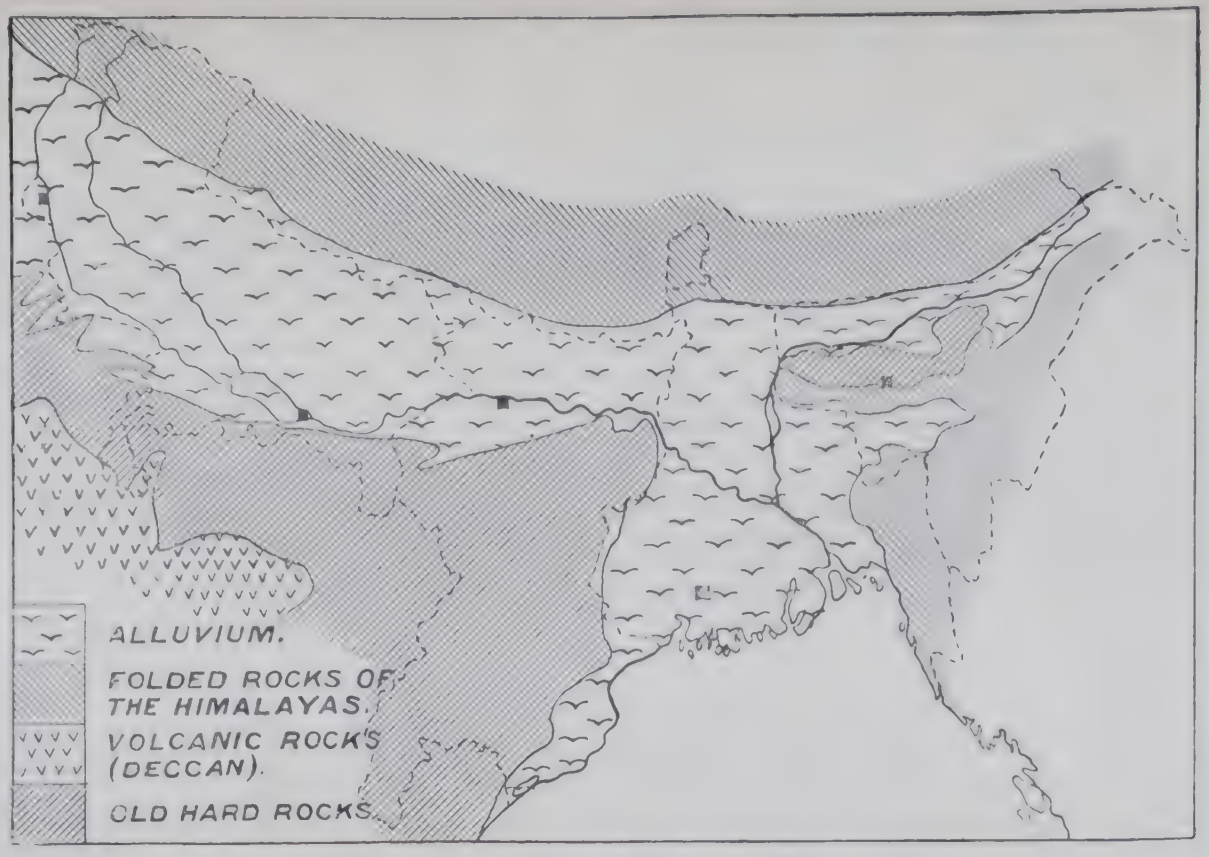

FIG. 11.—The Geology of North-Eastern India.

rocks are folded in this way they are compressed and made hard. The wrinkles form the lines of mountains of hard rocks. Now you will understand why some parts of India are mountainous and built up of hard rocks, whilst other parts consist of soft rocks which are easily worn away.

7. We will now go back and see now the physical features and the geology of North-eastern India are connected. The great mountain range of the Himalayas consists of hard, tightly folded sedimentary rocks. Rain and rivers—and frost too, for it is very cold in these high mountains—are now busily wearing away this great range and will gradually wear it down. Then the eastern mountains and hills also consist of folded sedimentary rocks sometimes with a core of old crystalline rocks. On the fringes in the Brahmaputra Valley the rocks are less folded and we find oil fields.

The Chota Nagpur Plateau is formed of a mass of very very old metamorphic or crystalline rocks. In long ages past they were sedimentary rocks, very much folded, but they have been changed by heat and pressure into a great mass of crystalline rocks. All these changes took place long long ago and for ages the Chota Nagpur Plateau—like the greater part of Peninsular India—has remained unchanged, only very slowly being worn away by rain and rivers. The Plateau was very like it is now when the great Himalaya mountains were still under the sea. You can picture the enormous number of earthquakes it has taken to raise the great Himalaya Mountains from the bottom of the sea to the great height which they are at present. During that time the rocks of the Chota Nagpur have remained unchanged. In these old crystalline rocks we find many different kinds of minerals and valuable ores.

Just round the edges of the Chota Nagpur Plateau are sedimentary rocks in which good coal is found.

All the low lands of our part of India are formed of mud or alluvium deposited by the great rivers. Even now the Ganges and the Brahmaputra are adding to their delta and gradually pushing it further out to sea. The Ganges in places still overflows its banks and leaves a thin coat of mud on the surface of the land.

The rivers too often change their course, sometimes depositing mud in one place, sometimes in another. In

this way the broad flat plains have been built up. We find that there are two kinds of alluvium—the old alluvium and the new alluvium. In the new alluvium which we find all over the Delta—in most of Bengal—there is not a stone of any kind to be found. In the old alluvium which is found in the Upper and Central Ganges Valley there are little hard pieces called 'Kankar'.

Study carefully Fig. 11, which is a simple geological map of India.

QUESTIONS AND EXERCISES

1. What is the principal difference between the valley of a young river and the valley of an old river? Give examples from North-eastern India of each class.
2. What is alluvium and how is it formed?
3. What is a volcano and how is it formed?
4. Why would you not expect to find oil and lead-ores in the same place?
5. Give a simple classification of the rocks of the earth's crust, with reasons for your arrangement.
6. Make a collection of any rocks you can and classify them.

CHAPTER IV

CLIMATE (I)

1. In the 'Hot Weather' you feel very hot in school, but in the 'Cold Weather' you are not so uncomfortable, because the weather is cooler. When we speak of the amount of heat or cold the weather has, we use the word 'temperature.' The temperature of a place at a certain time is the amount of warmth we feel there. 'Very hot,' 'Cool,' are words which do not tell us the amount of warmth exactly. You may say that the day is 'very hot' when some one else thinks that it is only 'hot.' We must have a more exact way of describing temperature than this, and so we use the thermometer. The word 'thermometer' means a heat measurer That is exactly what a thermometer is.

Fig. 12 is a picture of a thermometer. When things are heated they get bigger, or, as we say, they expand. If you get a toy india-rubber balloon and blow into it as much air as you can, and then hold the balloon near a fire, you will see it get bigger and bigger until it bursts. That is because the air you blew into it has become heated by the fire and has expanded until the balloon was not big enough to hold it. In a thermometer there is either mercury, which looks like silver, or alcohol. The mercury or alcohol is warmed or cooled by the air of the place in which the thermometer is placed. When the air is getting warmer and warmer, the mercury, or alcohol, expands and rises up the thermometer tube. When the air around cools, the mercury, or alcohol, gets smaller again, and sinks down the tube. On the glass of the tube are marked little divisions so that we can tell exactly how long the stream of mercury, or alcohol, is, and this, of course, tells us exactly how warm the air outside the thermometer is, because it is the air around that makes the mercury warm or cool.

Just as you can measure weight either by English pounds, Indian seers, or Burmese viss, so there are different 'scales,' as they are called, for measuring temperature. The two most important scales are the Centigrade and the Fahrenheit scales. The thermometers are made in exactly the same way, but the little divisions on the Fahrenheit thermometer are marked differently from those on the Centigrade thermometer. Sometimes you can buy a thermometer mounted on a piece of wood, showing the Centigrade scale on one side of the thermometer tube and the Fahrenheit scale on the other. The inventor of the Fahrenheit scale marked the height of the mercury in the thermometer when it was as hot as boiling water, and called the mark 212 degrees (written 212°). Then he marked it again when it was as cold as ice which is just beginning to melt. This mark he called 32 degrees. So between Freezing Point (ice) and Boiling Point on the Fahrenheit scale there are 212—32=180 little divisions or degrees. The inventor of the Centigrade scale called Freezing Point 0 degrees and Boiling Point 100 degrees, so that on his scale there are 100 little divisions between these two marks. The Fahrenheit scale is the one most generally used for measuring the temperature of the air. That is the thermometer shown in Fig. 12, and the thermometer we shall use in this book.

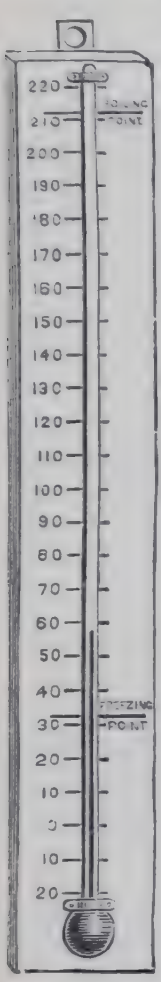

FIG. 12.—A Fahrenheit thermometer.

2. Now we can understand how the temperature in different parts of India is measured. Wherever there is a Government hospital in India and in many other places where there is no hospital, some one has the duty of looking at the thermometer every day at a certain fixed hour, and of writing down in a book the number of degrees to which the mercury has reached. As a matter of fact, the man who does this has two thermometers. Each of them has a little piece of glass or metal inside the tube with the mercury or alcohol. In one thermometer this little piece of glass rests

on the top of the mercury and is pushed along the tube as the mercury expands. When the air around gets cooler and the mercury sinks back down the tube, it leaves the little piece of glass behind at the highest point in the tube to which it reached when the air around was hot. Thus the little piece of glass shows the highest temperature reached on that day.

In the other thermometer which the man has, is alcohol, not mercury, and the little piece of glass is inside the stream of alcohol. As the alcohol shrinks when the air around gets cool, it drags the glass marker back with it. Thus the second thermometer shows the coolest temperature reached during the twenty-four hours. Every morning the man in charge shakes the little glass markers

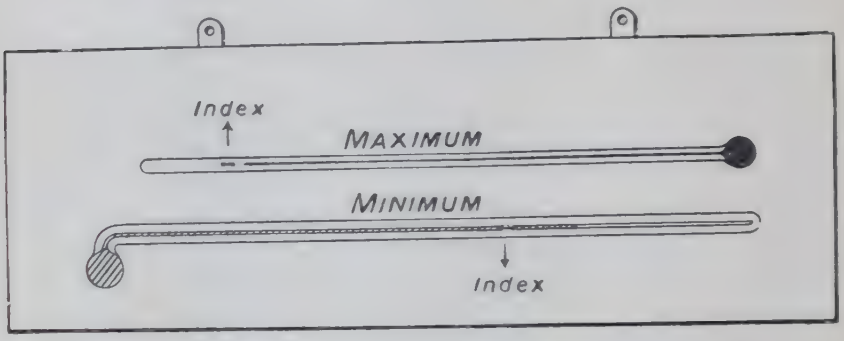

FIG. 13.—Maximum and minimum thermometers.

into their proper position again. Fig. 13 shows these thermometers. They are called Maximum Thermometer, that which shows the greatest temperature, and Minimum Thermometer, that which shows the least temperature.

When the man who looks after them has written down the Maximum temperature and the Minimum temperature, he adds the two numbers together and divides by two. As you know from your arithmetic lessons, this must give him the 'Average' or 'Mean' temperature for the day. This is the temperature which he enters in his book.

Here is the entry in the book at a place in India (Rangoon) for the month of December, 1923.

Date	Maximum	Minimum	Average
1st	87·9	75·8	81·85
3rd	87·8	74·1	80·95
4th	87·2	74·8	81·00
5th	87·4	74·8	81·10
6th	87·0	75·0	81·00
7th	87·5	74·9	81·20

At the end of one month, in order to find the average temperature for the month, the last column, 'Average,' is added up and divided by the number of the days in the month. After several years, the average temperature for the same month in each year is added up and the average monthly temperature is found. This gives the usual temperature for that month of the year. For example, the temperature of the same place for May can be seen from the following :—

Month	Year	Temperature
May	1914	85·0
May	1915	83·5
May	1916	83·5
May	1917	85·0
May	1918	82·2
May	1919	86·0
May	1920	84·4
May	1921	83·8
May	1922	84·4
May	1923	83·2

Thus the usual May temperature for this place is 84·0.

3. Let us now compare the July temperature of several places in North-eastern India.

Place	Average temperature in July
Calcutta	78·6°
Chittagong	76·5°
Allahabad	79·7°
Delhi	80·9°
Darjeeling	57·7°

We notice that the coolest place is Darjeeling, and the warmest places Allahabad and Delhi.

What happens during the 'Cold Weather'?

Place	Average temperature in January
Calcutta	66·4°
Chittagong	66·8°
Allahabad	61·0°
Delhi	58·8°
Darjeeling	40·6°

Here we notice that Darjeeling is again the coolest place, but Calcutta is warmer than either Allahabad or Delhi.

4. If instead of studying only five places, we considered every place in North-eastern India where the temperature is kept, we could make two maps of our country, each shaded to show the hottest and the coolest places, one map for the temperature in January, and one map for the temperature in July. These maps are drawn in Figs. 14 and 15. Fig. 14 is a map of North-eastern India shaded to show the actual temperature of places in January, and Fig. 15 is shaded to show the actual temperature in July.

Answer the following questions:—

(1) In which month is our country cooler, July or January?

(2) Which is the warmest part of North-eastern India in July?

(3) Compare both maps with Fig. 8, on page 14. What do you notice?

5. We know that for every 300 feet we mount up a hill-side the air gets one degree cooler, so that the tops of the mountains are very cold. That does not matter to us very much, because very few people, or none at all, live on the tops of the mountains. Yet in the hills there are many valleys where people do live, and the temperature of these places cannot always be shown in Figs. 14 and 15 without making the maps so full of different sorts of shading that they would not show anything clearly. You must remember then that Figs. 14 and 15 are only roughly correct in the hilly regions as they cannot show all the warmer valleys or the very cold hill-tops. In our part of India the most important and the most thickly populated parts are the plains and for these regions Figs. 14 and 15 are quite correct.

Some countries have no great broad plains but consist just of a mass of mountains and valleys and the temperature

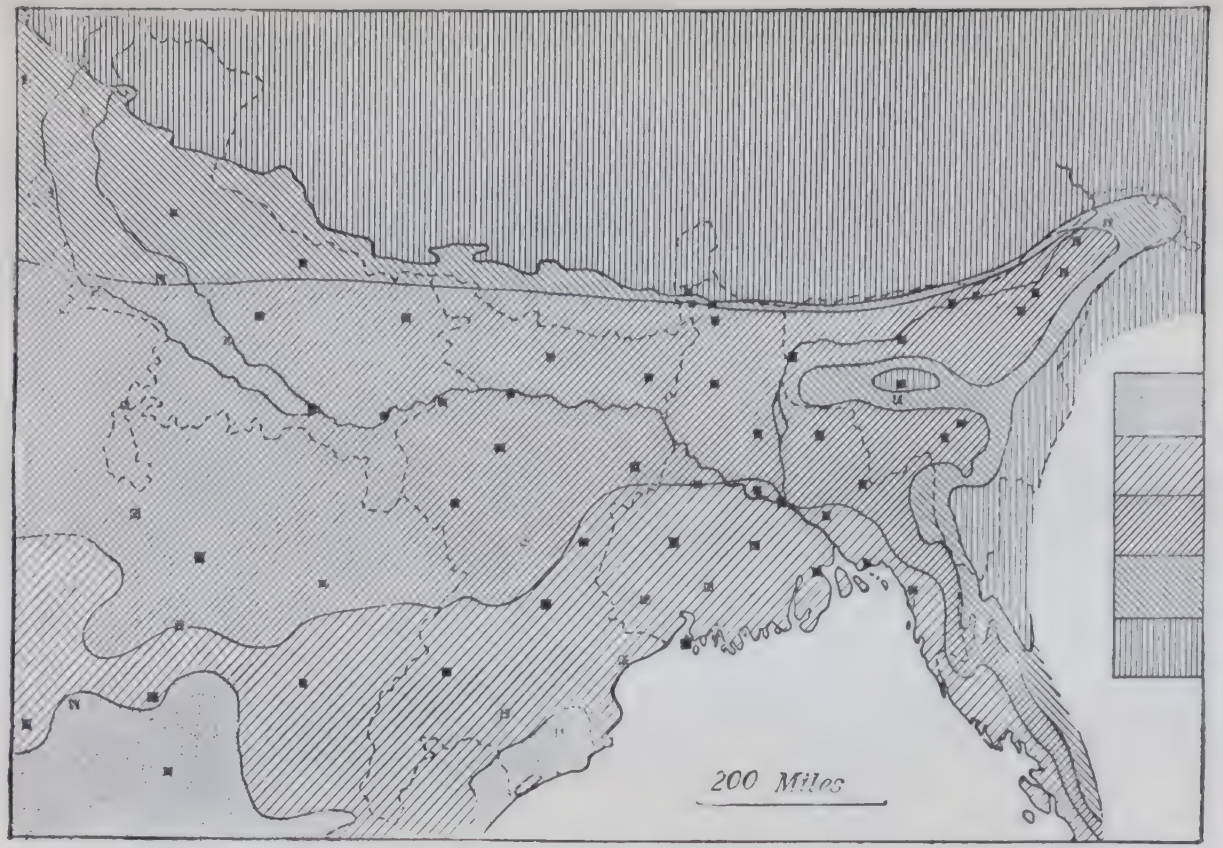

FIG. 14.—Map showing actual temperatures in January. The sqqare dots show the places where records are kept.

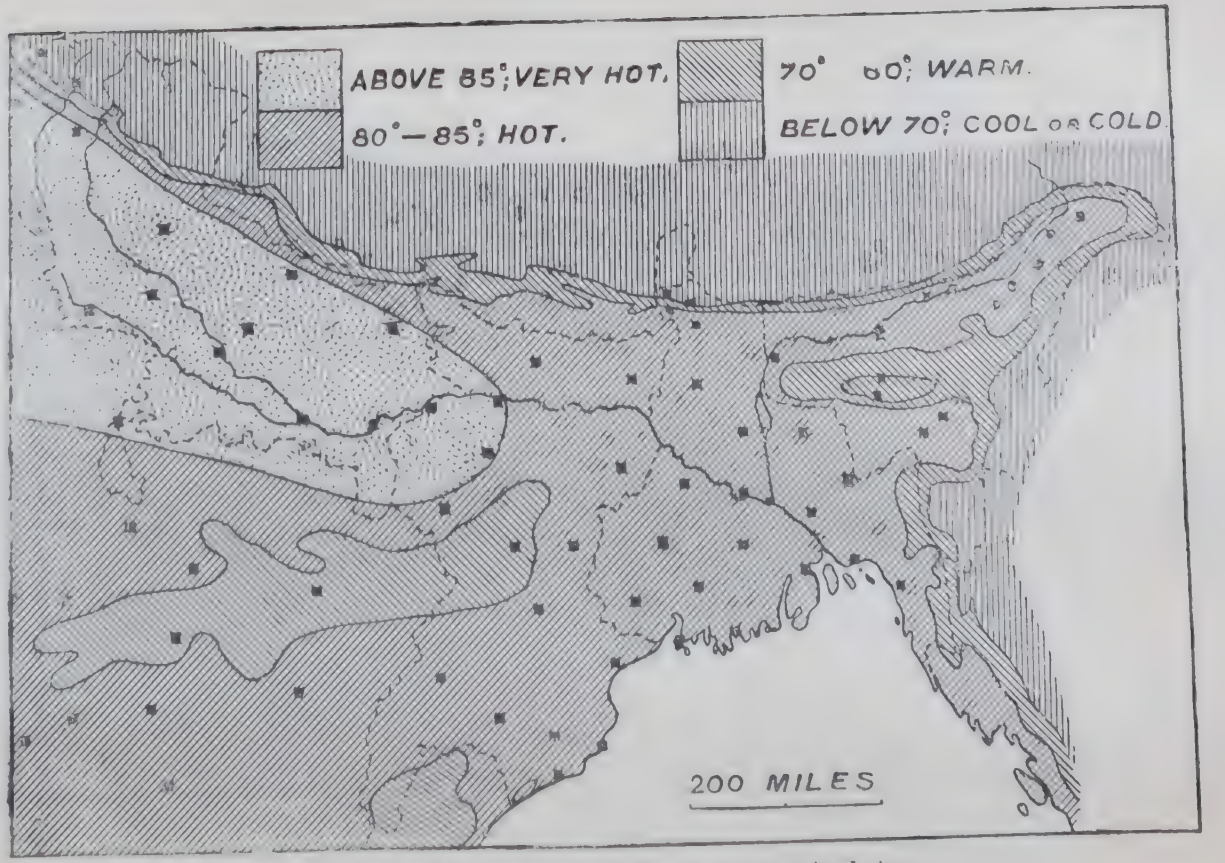

FIG 15.—Map showing actual temperatures in July.

of one place in a valley is quite different from that of another place a few miles away on a hill. In such a country the best thing to do is to take no notice of the height of the land as far as temperature is concerned. We know that for every 300 feet we climb upwards, the temperature is one degree less. We are thus able to make the temperatures of hilly places correspond with the temperatures of places at sea-level. In order to do this we add one degree to the thermometer reading for every 300 feet a place is above sea-level. Thus, if a village is situated 2,100 feet above sea-level, and we know its temperature is 63 degrees, we can imagine that if that same village were situated at sea-level its temperature would be 63 degrees plus 7 degrees, because 2,100 feet is seven times 300 feet and we must add 1 degree seven times to the thermometer reading. This is called 'Reducing the temperature to sea-level'. Because we are able to do this, we are able to draw a map of the temperature of a country without taking any notice of the fact that some parts are hills and some parts are plains or valleys. We must first mark the places on a map and then put against them their temperature if they were at sea-level. Then we can draw a line through all places marked with the same temperature. Such a line is called an 'isotherm.' An isotherm is thus an imaginary line drawn through all places having the same temperature when reduced to sea-level. We can show isotherms of monthly temperature for different months of the year. We can if we like draw isotherm maps of our part of India, but perhaps it is more important to study the actual temperature. The actual temperature maps will help you to realize the great heat of the plains and the great mass of cold air lying over the mountain wall of the north.

6. Let us look first of all at Fig. 14, the actual temperature map for January. There is the great area of cold to the north over the Himalaya Mountains and the Plateau of Tibet but few people live there and we need not consider it any further. Notice too how the hills of the east affect the temperature and that the temperature is rather less over the plateau regions in the south-west. Looking at all the flat land we see the southern part is warmer than the northern. Compare this with the January Table in

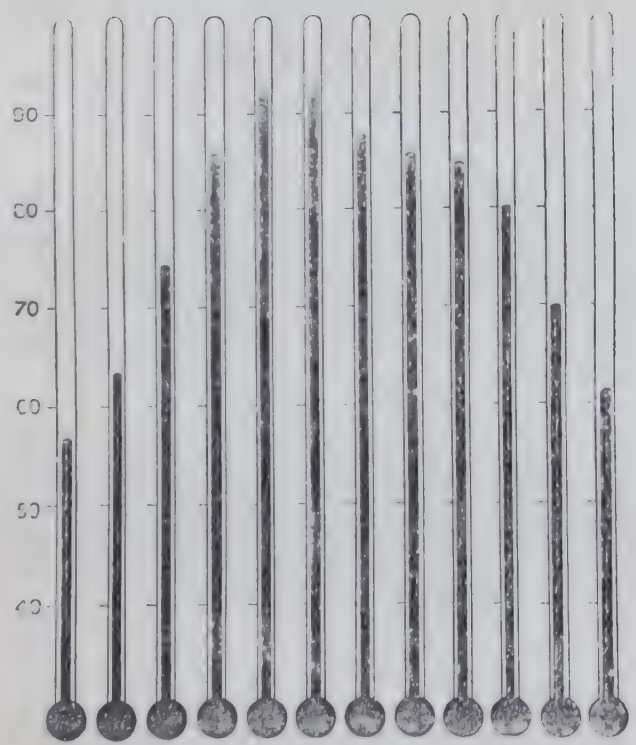

FIG. 16.—Diagram of Delhi temperature.

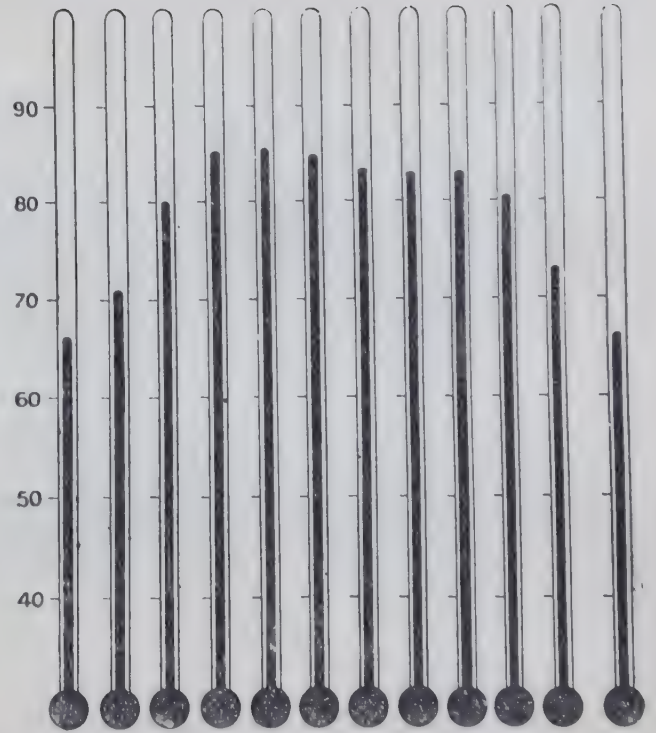

FIG. 17.—Diagram of Calcutta temperature.

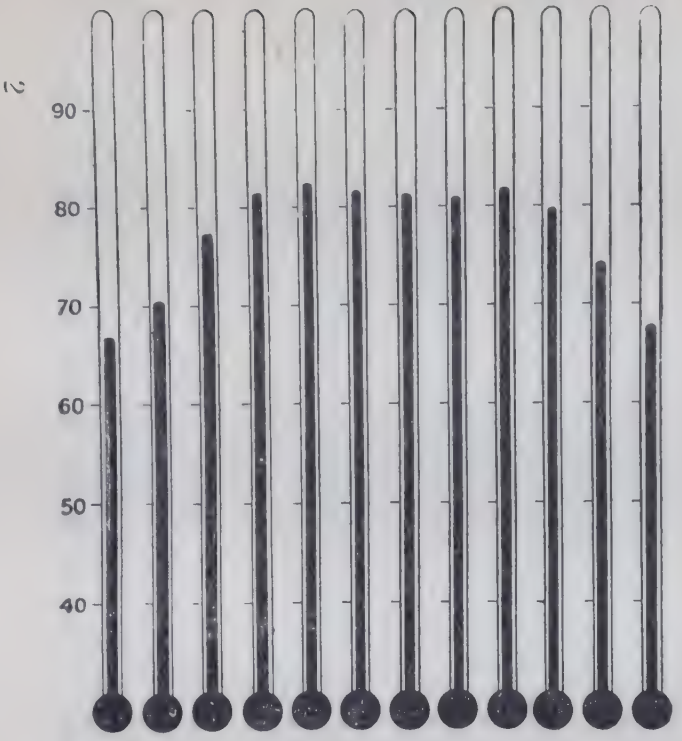

FIG. 18.—Diagram of Chittagong temperature.

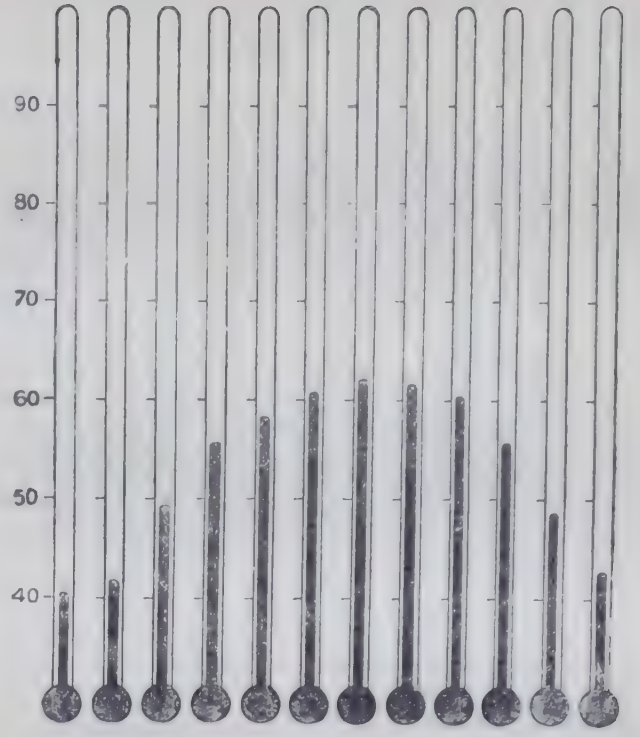

FIG. 19.—Diagram of Darjeeling temperature.

paragraph 3 of this chapter and you will see that the map and the table agree in what they tell you. Compare it also with what you have read on page 3 in connection with Fig. 3. The north is cooler than the south because

(1) the sun's rays are more slanting in the north and

(2) the north is nearer the great plateau of Central Asia, which gets very cold in the Cold Season.

Now look at Fig. 15, July. In July it is the other way round. The north-west part of the plains is warmer than the south. You will see that the line marked 85° makes a big bend to include a large part of the Ganges Valley. One reason why the north-western is warmer than the south is that it is near the great plains of the Punjab which get very hot in summer, while the south of our country, that is the coast of Bengal and Orissa, is near to the sea which keeps it cool. The 85° line tells us that Allahabad and Delhi and other places in that district are hotter than they should be. You will find out another reason for this in a later chapter. Fig. 16 shows by means of little pictures of thermometers the temperature in Delhi for each month of the year. That is, if you lived in Delhi and looked at the thermometer every day during January, the mercury would be seen to move up and down, but its average position would be like that of the first thermometer in Fig. 16. You will see that June is the hottest month and January is the coolest month. You will see that in June the thermometer reads 37 degrees more than it does in January. That is in June in Delhi, there are 37 degrees more of heat than in January.

Fig. 19 shows the temperature of Darjeeling for each month of the year. Darjeeling is a Hill Station, about 7000 feet above the plains (find it on your map) and so is much cooler during the whole year. The hottest month is July and the coldest is January ; the difference between the two is 22 degrees.

The difference is called the ' Annual Range of Temperature '.

Now look at Figs. 17 and 18. These show the temperatures of Calcutta and Chittagong for every month of the year. The hottest month is here May, but in Calcutta the temperature is only 86° and in Chittagong only 82° and not 94° as it is in the hottest month in Delhi. The

difference between the hottest and coolest months in Calcutta is 30 degrees, not 37 as in Delhi, and in Chittagong is only 15 degrees.

We have now seen from actual figures that places in the south are warmer than places (except those in the hills) further north in the 'Cold Weather,' and that the same places in the south are cooler than those to the north and west in the 'Hot Weather.'

Before we can tell why Delhi has a range of temperature of 37 degrees and Chittagong only 15 degrees we must learn something of the rainfall of India.

QUESTIONS AND EXERCISES

1. Draw picture, showing on the same scale a Centigrade thermometer and a Fahrenheit thermometer.

2. For the 24 hours ending noon on December 7, 1923, the maximum thermometer at Rangoon read 87·5° and the minimum 74·9°. Draw sketches showing the appearance of the two thermometers when the recording man looked at them.

3. What isotherms pass through the following places?

Calcutta	... sea-level	65°	(January)
Darjeeling	... 7,500′	42	(January)
Simla	... 7,200′	39	(January)
Lhasa	... 12,000′	27	(January)
Karachi	... sea-level	65	(January)
Bangalore	... 3,000′	70	(January)

4. What is the Range of Temperature between January and July at Delhi, Calcutta, Darjeeling and Chittagong?

5. Study Figs. 14, 15 and 18, and say what you notice to be the effect of height above sea-level on temperature, quoting examples.

6. What is the meaning of the small area of 'below 50°' shading in the middle of Assam on Fig. 14? Explain why it is there.

7. Look at Fig. 8. What does it tell you about the temperature of the mountain wall of the north? Explain this.

CHAPTER V

CLIMATE (2)

1. The most important thing we have to consider in connection with the climate of India is the amount of rain that falls in the country. We divide the year into 'Rainy Season' and 'Dry Season,' and the cultivators depend entirely upon the rainfall to give them good crops. Just as the temperature is carefully measured every day at certain places in India, by men who are in charge of the thermometers, so also, these same men have to measure every day how much rain falls.

To do this, each man is given an instrument called a 'rain gauge.' Fig. 20 is a picture of one, and if you go to the nearest Government hospital and ask the doctor in charge, he will doubtless show you the real one which he examines every day.

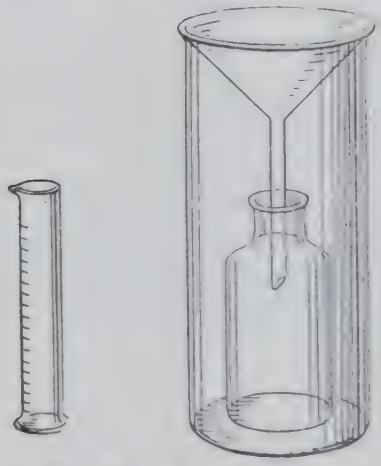

FIG. 20.—A rain gauge.

The raindrops fall into the mouth of the jar, and run down the funnel into the bottle inside. As the bottle is inside the jar, the rain collected in it does dry up, as the rain which falls on the ground 'dries up.' Every day the jar is opened and the bottle taken out. Then the rain-water in the bottle is poured into a glass which has divisions marked on it. Suppose that on a certain day the rain-water from the bottle fills the glass up to the 1·5 mark This will mean that if all the rain which fell on the ground in that town or village had stayed still on the top of the ground, and had not run away in streams, or soaked into the ground, or disappeared when the sun shone again, it would have been 1·5 in. deep. In other words, 1·5 in. of rain fell in that place.

The man in charge of the rain gauge then enters into his book the date, and writes against it, 1·5 in. of rain. At the end of the month he adds up the total number of inches of rain that have fallen during that month, and he, and all the other men who have had charge of rain gauges, send the records to the principal town of the province (Shillong, Calcutta, Patna or Allahabad), where they are carefully printed and kept. The average amount of rainfall for each month and for the year is calculated in the same way as the average temperature for the month or year.

2. The following figures are copied from the records of Dacca for a certain year (1922):—

DACCA

Month	...	January	February	March	April	May	June
Rain	...	—	—	0·32	2·71	1·79	18·50

Month	...	July	August	September	October	November	December
Rain	...	9·64	19·27	9·63	11·16	0·72	—

Notice in which month there was most rain, and in which

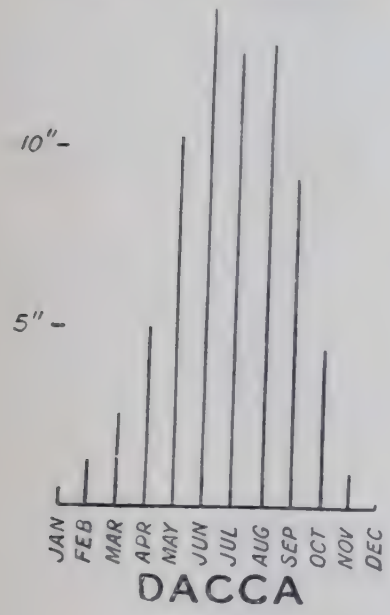

FIG. 21.

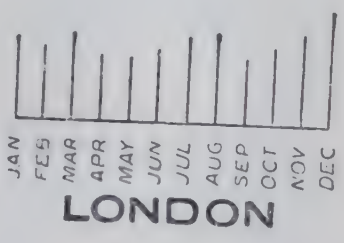

FIG. 22

months there was no rain at all. In order to show you very clearly the months in which most rain falls in Dacca,

the average figures for a number of years have been drawn in a diagram, Fig. 21.

Fig. 22 is the same sort of picture showing how much rain falls in the different months of the year in London. You will see that London gets very little rain compared with Dacca, but that Dacca gets a lot of rain in some months and very little in other months. London gets almost the same amount of rain every month in the year. This is because Dacca is in India, which is a 'Monsoon' country, and London in England, which is a 'rain throughout the year' country.

We will now examine the records of several places in North-eastern India and see what we can learn from them about the rainfall of our country. Look at the following table :—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Normal total of a year
Chittagong ...	0·40	1·06	2·40	4·70	9·82	21·87	24·62	20·89	13·50	7·19	1·73	0·68	108·86
Sylhet ...	0·63	1·29	6·24	14·09	20·80	31·43	26·94	25·67	21·56	9·15	1·08	0·28	159·16
Cherrapunji...	0·65	3·32	9·50	30·78	43·50	93·94	108·19	83·87	34·42	20·40	2·24	0·44	431·31
Calcutta ...	0·48	1·10	1·48	2·04	5·78	11·21	12·38	11·62	9·89	4·22	0·59	0·20	60·99
Puri ...	0·28	0·77	0·51	0·62	2·66	7·39	9·99	11·12	9·49	7·38	3·09	0·40	53·61
Patna ...	0·58	0·67	0·46	0·31	1·68	7·83	11·71	12·73	7·70	2·68	0·28	0·11	46·74
Allahabad ...	0·65	0·47	0·28	0·13	0·27	4·25	11·70	11·04	6·01	2·34	0·26	0·26	37·66
Lucknow ...	0·82	0·61	0·35	0·28	0·93	4·49	11·46	11·21	7·14	1·39	0·17	0·35	39·20
Delhi (near)..	0·84	0·59	0·47	0·27	0·64	2·78	7·64	6·62	4·76	0·18	0·10	0·33	25·22

The figures beneath the word 'Total' show how much rain fell in the whole year. You can see quite plainly that the places in this list which have the heaviest rainfall are Cherrapunji, Sylhet and Chittagong, and that the places which have the least rainfall are Allahabad and Delhi. Calcutta and Puri have quite a good rainfall, and so has Patna. Fig. 23 shows you this still more clearly by means of lines.

If these nine towns were the only places in North-eastern India where rain gauges were kept, we might say there are three divisions in our part of India, the 'heavy rain' division, the 'moderate rain' division, and 'very little rain' division. But there are many more places than these nine towns in North-eastern India where rain gauges are kept, and if we examine all their records, taking the 'average' for all the years since the records

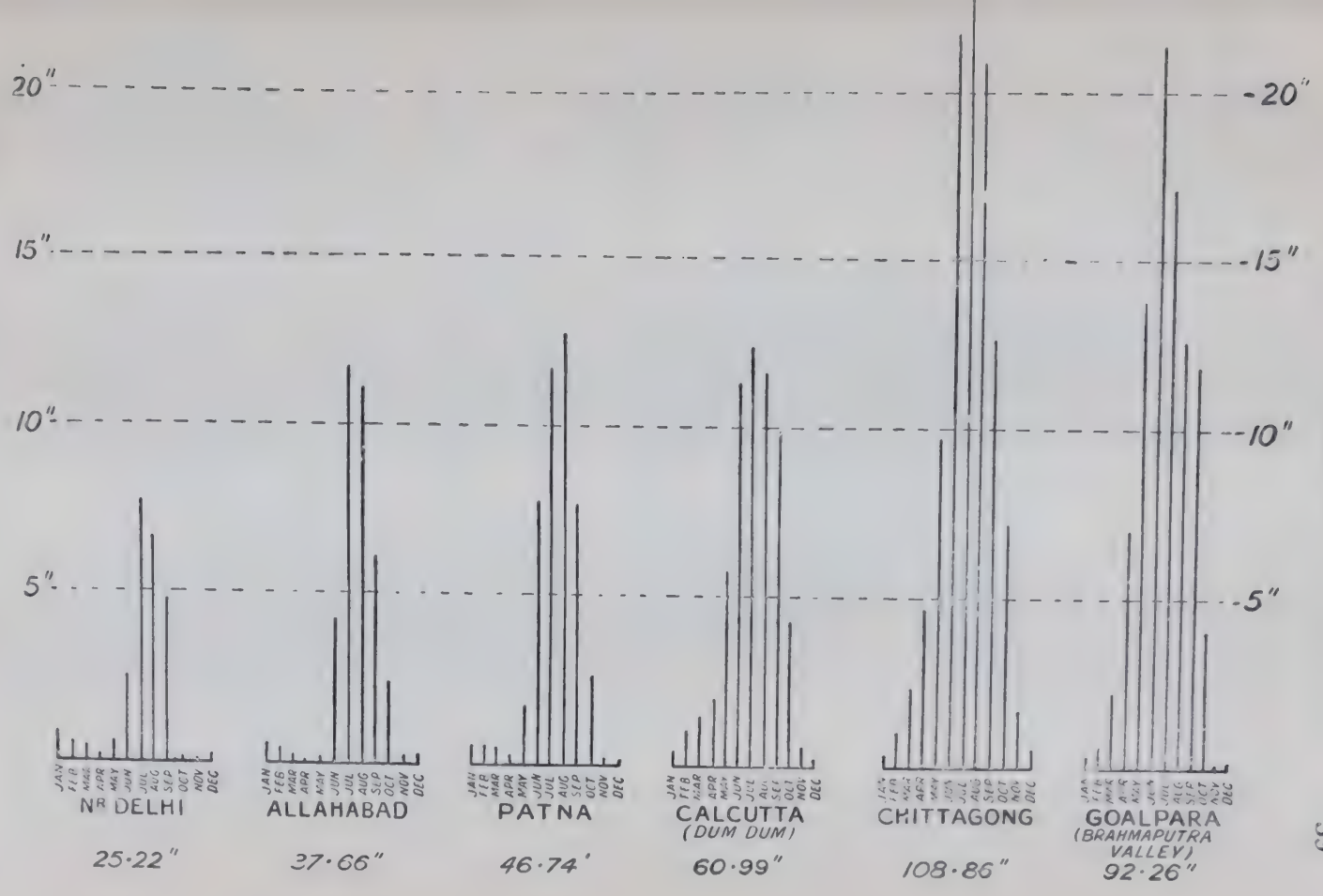

FIG. 23.—Rainfall graphs of towns

were first kept, we can mark on a map of the country the annual or yearly rainfall for each place where there is a rain gauge. Then we can draw lines on the map joining all places which have the same rainfall. There will be a line of 40 inches of rain, one of 50 inches, another of 60 inches, and so on. Then we can make our map still more clear by using different kinds of shading. We may use one kind of shading to cover all places having between 40 and 60 inches of rain per year, another kind for places receiving between 60 and 80 inches. Such a map is called Rainfall Map. As we all know, most of the rain falls in one part of the year in our part of India, in the 'Rainy Season,' and very little falls during the rest of the year. Because of this we could have two rainfall maps of North-eastern India, one for the rainy season, June to September, and one for the dry season, October to May.

For most purposes it is more important to know the amount of rain which falls during the whole of the year. So in Fig. 24 you have a rainfall map of North-eastern India for the whole year. Notice that the least rain falls in the upper part of the valley of the Ganges, and that the Assam hills and slopes of the Himalayas are the wettest parts.

It is only necessary for us to remember that most of this rain falls during the rainy season, from May to October.

Study Fig. 24 very carefully. Notice that it has marked on it only two rainfall lines, the lines of 40 inches and 80 inches. These two lines divide our part of India into three parts.

(*a*) Poor rainfall division with less than 40 inches of rain in a year. Here, as you will learn later, the Dry Belt crops such as millet, wheat, barley and maize grow; rice can only be grown when water is to be obtained from the 'irrigation canals' made by Government and the other crops, too, only grow well when the land is irrigated. You will see that the poor rainfall division covers most of the Upper Ganges Valley (United Provinces). In Chapter IV we found out that this part of India differs from the other regions in temperature. Now we have found out that it differs from the rest of our part of India in the amount of rainfall it gets.

(*b*) Moderate rainfall division which has between 40

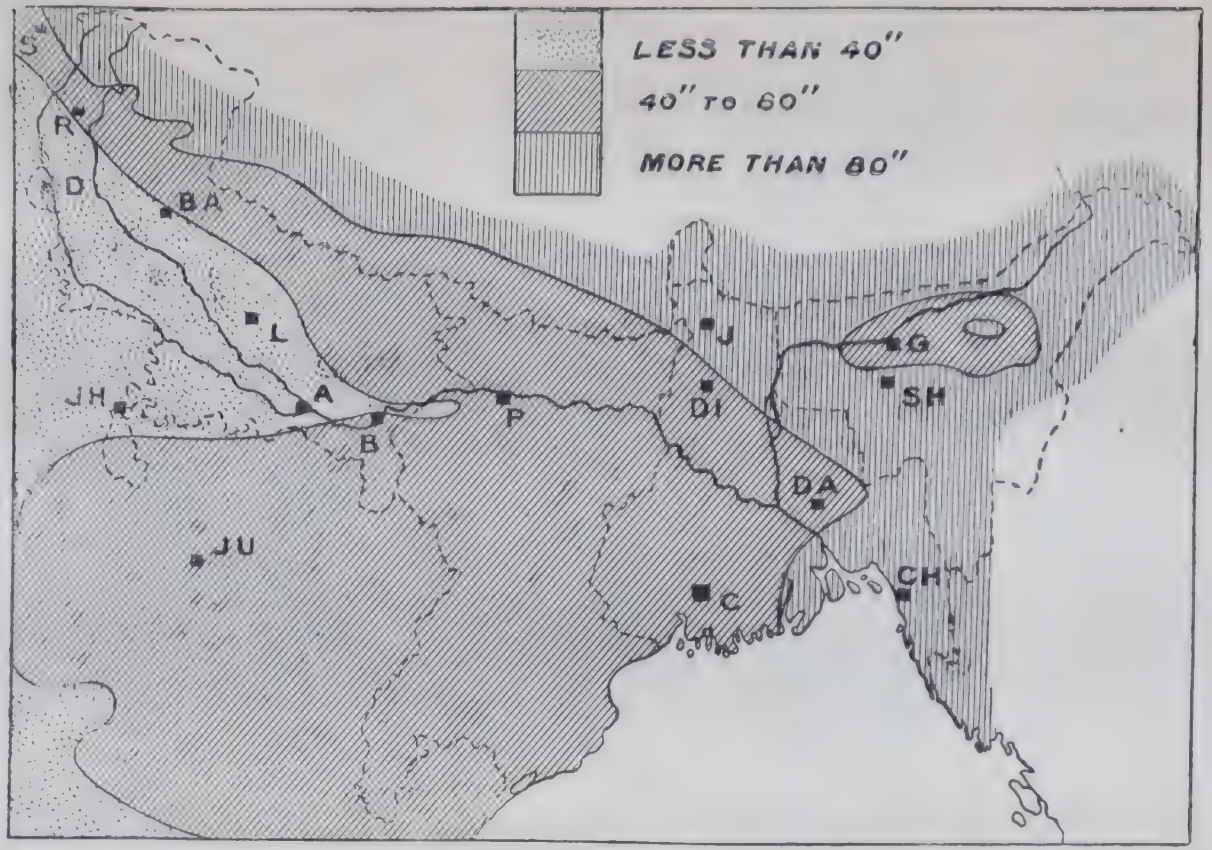

FIG. 24.—Rainfall map of North-Eastern India for the whole year.

and 80 inches of rainfall. In the hilly regions fine forests of sal grow with this rainfall, in the plains there is a mixture of Dry Zone and Wet Zone Crops.

(*c*) Good rainfall division which has more than 80 inches of rainfall. In the plains rice is everywhere the most important crop and the hills are covered with thick evergreen forest or jungle.

QUESTIONS AND EXERCISES

1. Using the figures given on p. 38, draw rainfall graphs for the towns of Chittagong, Sylhet, Cherrapunji, Calcutta, Puri, Patna, Allahabad and Lucknow. What are the driest and the rainiest months in each case?

2. Compare Fig. 24 with Fig. 87 and then say what parts of North-eastern India are in the ' Dry Zone '. What parts are in the ' Moderate rainfall division,' and the ' Good rainfall division ' ?

CHAPTER VI

CLIMATE (3)

1. During the hot weather in Chittagong or Puri, a strong breeze often blows in the afternoons and dies away in the evenings. It is a breeze from the sea and is very refreshing.

The cause of it is this. The sun shines equally on the land around Chittagong and on the sea in the Bay of Bengal; but the land takes in the sun's heat much more easily than the water does. This you can prove for yourself on a hot day by touching the ground with one hand while you put your other hand into a big stream. You will find the land hotter than the water. Therefore the air over the Bay of Bengal is cooler than that over Chittagong during the daytime on a hot day. Warm air is light,

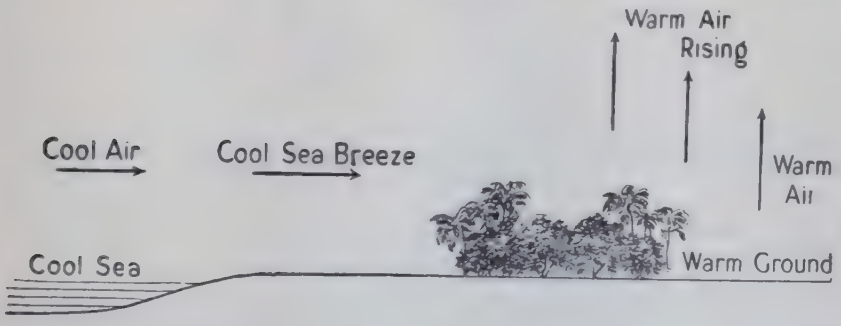

FIG. 25.—Land and Sea Breezes.

and cooler air is heavier. Thus the air over the sea, as well as being cooler than the air over Chittagong, is also heavier. Now, if you pour cold water into one end of a tub half full of hot water, it does not stay at the end of the tub, but spreads throughout the hot water. In the same way, the cool heavy air over the Bay of Bengal does not stay there. The warm light air over Chittagong rises and the cold heavy air flows in to take its place. This

movement of the air is the refreshing breeze which the people of Chittagong feel. Fig. 25 illustrates this by means of arrows.

2. The case of Chittagong in the hot weather is a small example of what is going on in the huge continent of Asia. In the summer, June to September, the sun shines powerfully over Central Asia, and the land gets very hot, particularly in the north-west of India itself (Punjab). At the same time, the Indian Ocean remains fairly cool. The result is that, like the sea-breeze in Chittagong, the cooler and heavier air from the Indian Ocean flows from the sea to the land during these months. It does not blow

FIG. 26.—The Monsoon lands of Asia.

directly inwards, because, as you know, the earth is turning round like a top, and this alters the directions. Fig. 26 shows this movement of the air by means of arrows.

This condition lasts from June to October, and the winds that blow from the sea into the interior of Asia are called the Monsoon winds or Monsoons. In India and Burma they come from the south-west, and so they are the South-West Monsoons. Now we can realize that, in the matter of the Monsoon winds, our country is a small part of a much larger climate system which includes all South and South-east Asia.

3. Fig. 27 shows that the air high above the hill-tops is lighter and thinner than the air at the level of the sea, because the lower layers of air are pressed down by the weight of the layers of air above. Therefore, if the South-West Monsoon meets mountains when it reaches the land, and rises to pass over them, it moves upward into a region where the air is lighter and thinner. Now, if you open the valve of a bicycle tyre and let the escaping air blow on to your hand, it feels cold. This is because the air in the

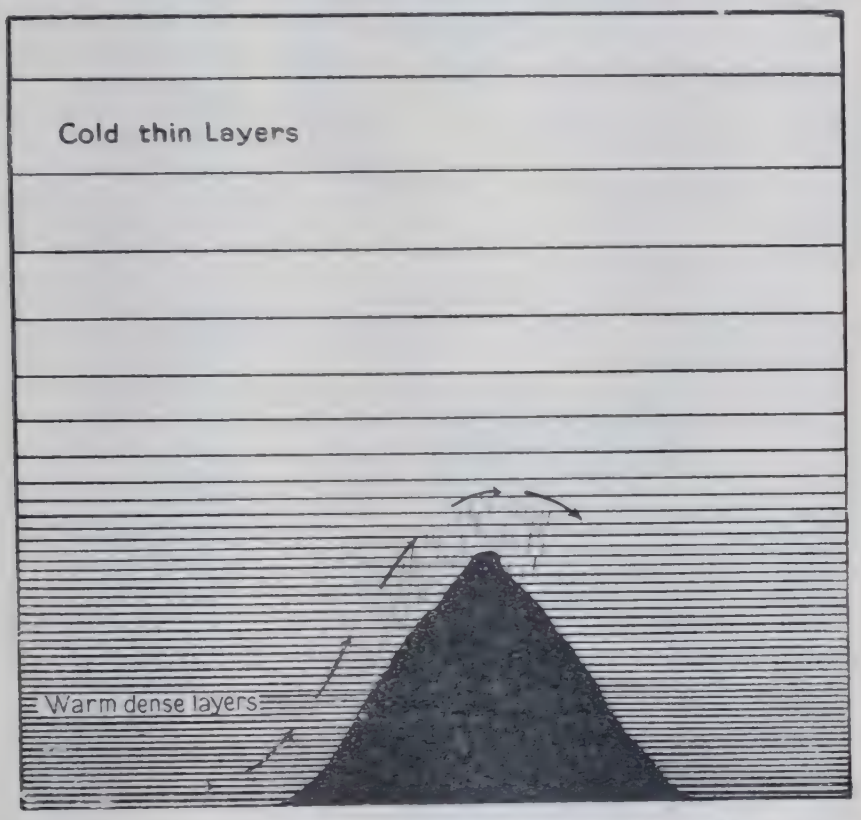

FIG. 27.—Showing air rising from a region of warm dense layers to a region of cold thin layers, when crossing a range of hills.

cycle tube, coming out of the valve, has a chance to expand, and when air expands, it gets cool. In the same way, when the South-West Monsoon rises to cross the mountains, it also expands and gets cooler. Cool air cannot carry as much moisture as warm air, and so the South-West

Monsoon has to drop some of the moisture it carries, and this falls as rain.

This is what happens when the Monsoon rises over the Khasi Hills of Assam, and the result is the heavy rainfall which is shown in Fig. 24. It also explains the heavy rainfall on the mountains of the north of India, and the good rainfall on the Chota Nagpur Plateau.

4. The Monsoon does not blow from the south-west in every place in India. The following table shows the direction of the Monsoon in the places named :—

Place	Direction of Monsoon
Chittagong	S.S.E.
Dacca	S.
Calcutta	S.
Puri	S.W.
Patna	E.
Allahabad	E.
Delhi	S.E.

If these directions are shown on a map of the mountains of North-eastern India, the explanation of the differences becomes clear.

Examine Fig. 28. It is clear that the direction of the Monsoon wind depends on the direction of the mountain ranges and the river valleys. The big arrow over the Bay of Bengal shows the normal direction—from the S.W. The long arrows on Fig. 28 mean that the wind direction during the Rainy Season is constant, short arrows mean that it varies. Notice that nearly everywhere the wind blows parallel to the length of the mountains and high land, that is, it blows along the valleys. It is easier for the wind, just as it is for men, to travel along valleys than to cross hills.

5. We can now explain why the upper part of the Ganges Valley only receives a little rain. Before it reaches that region the rain-bearing Monsoon wind has travelled right up the Ganges Valley from the Delta and lost a large amount of its moisture. In Chapter IV you learnt of the high temperatures found in the Upper Ganges Valley, during June, July, August and September. Hot air can hold more moisture than cold air, so that when the Monsoon wind reaches the Upper Ganges Valley it is warmer and so can hold more water, instead of giving it up

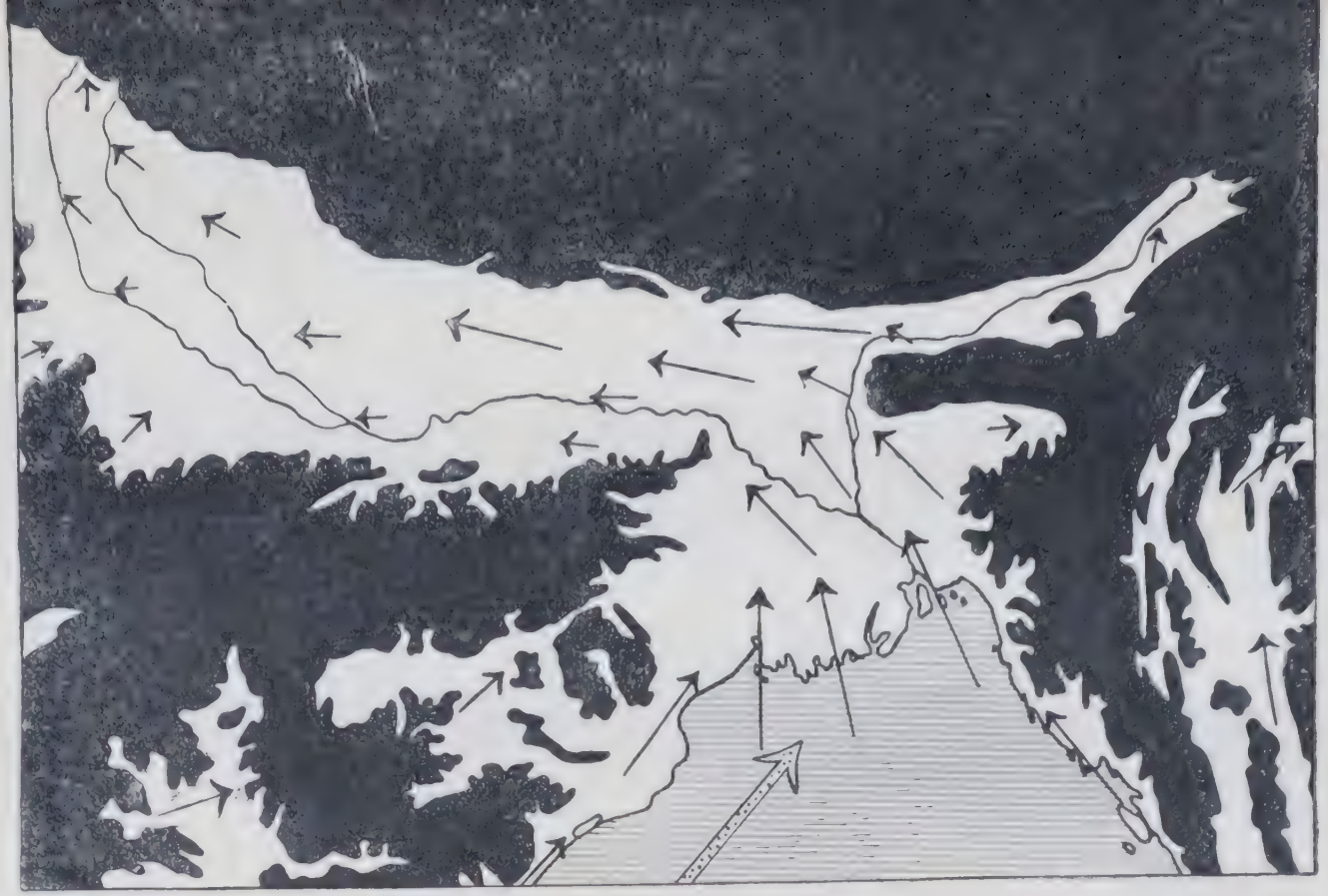

FIG. 28.—Map of North-Eastern India showing how the South-West Monsoon winds are deflected by the ranges of hills and mountains. All land 1000 feet high in black.

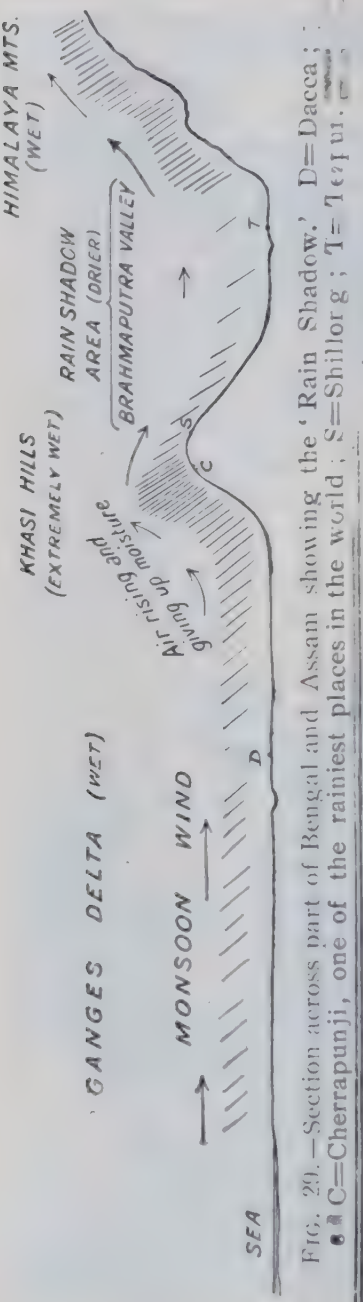

FIG. 29.—Section across part of Bengal and Assam showing the 'Rain Shadow.' D=Dacca; C=Cherrapunji, one of the rainiest places in the world; S=Shillong; T=Tezpur.

as rain. You will notice, too, that the wind does not have to cross any hills and does not, therefore, give up much moisture.

Look again at Fig. 24 and notice the small area of 'moderate rainfall' in the Brahmaputra Valley, surrounded by regions of 'good rainfall.' If we imagine the Monsoon wind blowing from the south-west we see that it must cross the Garo and Khasi Hills before reaching the Brahmaputra Valley. The warm moist air rising gives up most of its moisture and so Cherrapunji, on the slopes of the Khasi Hills facing the wind, has an enormous rainfall of over 400 inches. It is one of the rainiest places in the world. When the wind has crossed the hills and commences to descend into the Brahmaputra Valley, it is much drier and so the rainfall is only small. We can best summarize the reasons for the small rainfall in the Brahmaputra Valley by making a diagram like Fig. 29.

When a light falls on an object, a shadow is formed on the opposite side of the object. In the same way, when rain falls on one side of a hill, there is a 'shadow' of dryness on the other side. The dry area is called the 'Rain Shadow.' There are many other examples of 'rain shadows' in the world as well as the small one we have in Assam. The Deccan is in the rain shadow of the Western Ghats. The East

Coast of England is in the rain shadow of the Pennine Range. Look these up in your atlas, and others.

6. We must now consider what happens during the Dry season. At that time of the year the sun is shining vertically south of the equator, and the great land mass of Asia gets very cold. The cold air blows down from the north towards the equator to take the place of the warm light air there. The rotation of the earth changes its normal direction from north to north-east, but in North-eastern India it follows the lines of the valley just as the South-West Monsoon does, and so its direction is more often nearly west in the Ganges Valley and north in the Delta. This wind comes from a colder region and so is cool, but it blows from a land mass and so does not carry any moisture. It is then a dry wind and brings no rain. This wind is sometimes called the North-East Monsoon, but it is really the same as the North-East Trade Wind which blows in the northern tropics in other parts of the world.

7. We have now discovered the answer to the question, 'Why is there so little rain in the Upper Ganges Valley?' We have still to find out, 'Why is this region so much hotter than the rest of our country?'

One reply we can make at once, is to be found at the beginning of this chapter, namely, the influence of the sea keeps the coastal parts of the country cooler in the hot weather. We may add that the sea also makes the coastal places warmer in the months of January and December, when Delhi is cool. A further reply is this: There can be no rain without clouds, therefore, in North-eastern India except the dry parts, the sky is generally covered with cloud in the wet season and just before and after it. Because of this, the sun does not shine directly on to the ground, and this helps to keep it cooler than the ground in the dry regions. In the dry regions there are few clouds and brilliant direct sunshine reaches the ground.

QUESTIONS AND EXERCISES

1. What do you think is the normal direction of the Monsoon winds at Goalpara, Cuttack, Jalpaiguri, Agra, Cawnpore? Draw sketches to show your reasons.

2. What do you think is the direction of the wind during the dry season at Lucknow, Benares, Patna, Dacca, Calcutta and Puri? Why?

3. Explain the causes of the rainfall at Darjeeling (120 inches) and Mussoorie (94 inches).

4. Explain why rain falls on the windward side of hills.

5. Why is the western side of the dividing range in Australia drier than the eastern side?

CHAPTER VII

VEGETATION

1. Different races of mankind live in different ways, some men are chiefly hunters, like the Red Indians of America, some are cattle-keepers, like the Zulus of South Africa, others depend upon fishing, like the Esquimaux, and so on. The way in which men live depends chiefly on the plants which will grow in the lands in which they live. Plants require water, and plenty of it, so that in very wet countries there will be thick forest and jungle. In the drier lands there will be grass or shrubs with trees here and there. In the lands where there is no rain nothing will grow, and the place will be a desert.

Man does not depend only on the plants that will grow by themselves. After thousands and thousands of years man has learned to grow things purposely in fields and plantations which he himself has made. The people of the jungle lands were chiefly hunters at first as the Pygmies of the African Forest, and the wild tribes of the Amazon Forest are to-day. But later on, they learned to clear away the trees in suitable patches in the jungle, and could cultivate a few crops, as do the Nagas of Assam. At last, in some of the hot wet lands, we find men refusing to let the jungle grow over huge areas, and in the place where it would be they cultivate hundreds of square miles of fields of rice. In temperate lands, as in Canada and Europe, men have removed the trees of the forests and grow grain suitable to that climate. Similarly in the grass lands the people are naturally cattle-keepers, but they, too, plough up the grass and in its place cultivate those plants which they require—wheat, for example, in the prairies of Canada.

2. Now suppose there had been no human beings at all in India. What would be the appearance of the country? Instead of rice fields there would be just jungle, there would

be no villages with toddy palms or coconuts. The country would be covered with the sort of forest and jungle which can be seen at present where men have not interfered with it very much. Plants which grow by themselves form the natural vegetation of the country. Therefore, if man had not lived in India, it would be covered with its natural vegetation. In very many parts of India, there are few villages, and man has not altered the natural vegetation very much; but in places like the fertile rich lands of the Delta and Valleys of the Ganges and Brahmaputra, he has changed it a great deal. The natural vegetation of a country depends mainly on the rainfall, the heavier the rainfall the thicker the natural vegetation will be.

If we study Fig. 30, we can tell what the natural vegetation of North-easfern India consists of. In the rainier parts there is forest; in the driest parts there is land which is almost, but not quite, desert. On highlands like the Chota Nagpur Plateau which have a fair rainfall there may be grassland.

From this we know that rainfall is the most important cause of differences in natural vegetation; but there is another important cause, and that is the height of the land above sea-level. Above 5,000 feet, there is always a great change. For example, the teak tree and the sal tree will not grow above 5,000 feet, however abundant they are just below.

Let us now consider the different types of natural vegetation.

(*a*) *Evergreen Forest.*—When the rainfall is more than 80 inches (see Fig. 24), the forest is green all the year round. There are many different kinds of trees, often they are of very large size, but their wood is generally very hard and up to the present these forests have not been much used commercially. In these areas of very heavy rainfall nearly all the low land has been cleared to make room for paddy fields. This sort of forest occurs over large areas in Assam, in the Eastern Hills Region and also in the Brahmaputra Valley. In the wetter eastern part of the Himalayas it is also found but only up to 5,000 feet.

(*b*) *Sundarbans or Mangrove Forests.*—The roots of the mangrove tree (sundri) must be covered by salt water

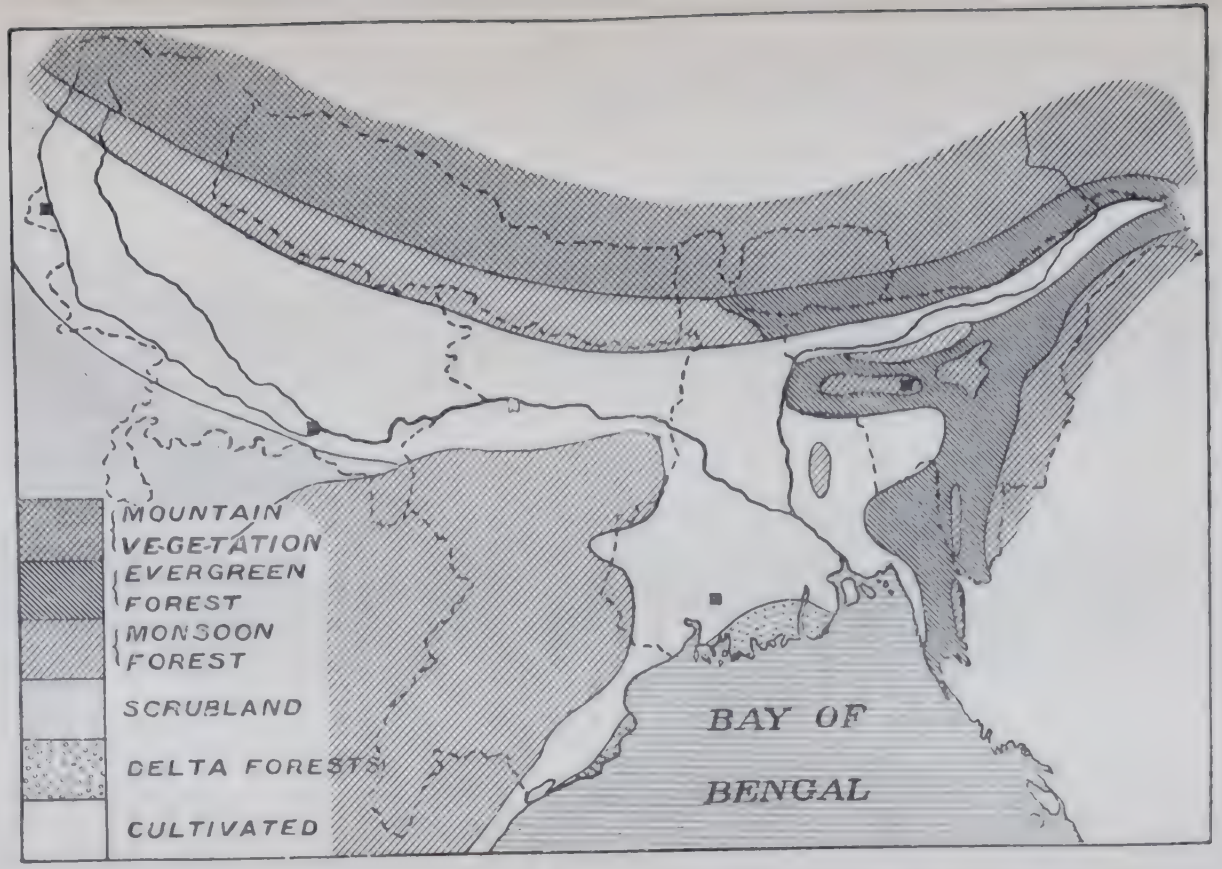

FIG. 30.—The Natural Vegetation of North-Eastern India.

at every high tide and so we find the mangrove forests growing on the edge of the Delta near the sea. There are several different kinds of mangrove and some of them supply good wood as well as firewood for towns in the Delta.

(*c*) *Monsoon Forest.*—Where the yearly rainfall is more than 40 inches but less than 80 inches, the country is covered with monsoon forests. We must remember that nearly all the flat land in the Valley of the Ganges and the Delta has been cleared and used for cultivating crops and so we do not see the natural vegetation there at all. There are two big areas where the monsoon forests are found in our part of India. One is along the Sub-Montane tract in the north and the other is the Chota Nagpur Plateau. The trees of the monsoon forest lose their leaves in the Dry Season to protect them against the heat. The monsoon forests yield very valuable timber and the most important tree is the sal. The stretches of sal forest are sometimes interrupted by areas of coarse grass with scattered trees. You will learn more about this under the Sub-Montane Region. These forests are very valuable and in order to protect them and prevent them from being destroyed the forests are now largely 'reserved' by Government.

(*d*) *Dry Zone Vegetation.*—Where the rainfall is less than 40 inches in a year we find it is too dry for forests to grow properly. A few trees grow but most of them are armed with spines or thorns to prevent them being eaten by animals. Forests of small thorny trees are called Thorn Forests. Sometimes the trees are so small that they are really only bushes and are often far apart. We call such land 'Scrub Land'. Notice that Thorn Forest and Scrub Land are found on the dry edges of the plateau in the southern part of the United Provinces.

(*e*) *Mountain Forest.*—On the Himalaya Mountains between 5,000 and 12,000 feet we find the forests are very similar to those found in Temperate lands. You have learnt that as you climb a mountain it gets colder and colder. So the temperature gets lower and lower and so between 5,000 and 12,000 feet on the Himalayas it is the same as in Temperate lands and we find forests which we can call 'Temperate Forests'. These mountain temperate

forests are evergreen ; and there are two chief kinds ; one with broad leaves (Oak Forests) and another in which the trees have needle-like leaves (Coniferous Forests). Notice where they occur. Typical trees in the Coniferous Forests are the pines ; they yield good soft wood, turpentine and resin but often they are too far away and too difficult to reach to be much used.

(*f*) *Alpine Vegetation.*—Above 12,000 feet on the Himalayas it is too cold for trees to grow. Above that level we find only small bushes and short grass. This is called 'Alpine Vegetation.' At 16,000 feet we reach the 'Snow line' above which there is always snow.

3. The plants which men grow purposely in fields and plantations are called the 'artificial vegetation' of a country. Fig. 30 is a true map except for those parts of the country where villages and towns are thickest ; in these places, man has cut down the 'natural vegetation,' and in its place he has cultivated artificial vegetation, i.e., crops of his own, and as fast as the 'natural vegetation' tries to grow in the form of weeds, he cuts it down and clears it away. Over very large areas, as in the Ganges Valley there is no natural vegetation left at all. But man cannot grow exactly what he wishes, for 'artificial vegetation' is just as dependant on rainfall as is 'natural vegetation'. Roughly, the cultivated crops of North-eastern India can be divided according to the rainfall of the regions in which they grow:—

(*a*) Low wet crops which grow mainly on flat land where the rainfall is good.

(*b*) Low dry crops which grow in a drier climate but again mainly on the low valley land.

(*c*) Crops of the hills and hill slopes.

(*a*) *Low Wet Crops.*—The chief of these, of course, is rice. Rice requires considerable heat from the sun, and a great deal of moisture. Therefore it is grown where there are heavy rains to flood the land, or where man has built canals to bring water to his fields. So we find it is grown in our country mainly in the lower part of the Ganges Valley and the Delta where the rainfall is very heavy. It is everywhere the principal crop. A considerable amount is also grown in the upper part of the Ganges Valley where the rainfall is less than 40 inches, but there the

water is brought to the fields in canals. In the drier regions rice is not the most important crop however, being exceeded by wheat. In the Delta jute is very important.

(*b*) *Low Dry Crops.*—Wheat is very important and so is barley, followed closely by cotton, millet, sesamum, maize and others.

(*c*) *Crops of the Hills and Hill Slopes.*—In Assam tea is important. Other crops growing away from the plains are maize; in drier parts cotton, millet, etc., whilst in higher regions on the Himalayas European vegetables and fruits may be noted.

We can learn a great deal about crops from the Government Reports on Agriculture.

4. An 'acre' of land is about half the size of an ordinary football field, marked out according to the rules of football. In all the area we are studying there are about 106,878,000 acres of cultivated land. That is if all the cultivated land were given up to football, there would be about 53,400,000 football fields, and every three people in the country could have a football field of cultivated land to themselves. Since so much ground is given up to cultivation you can now understand why our country is called an agricultural country.

We will now take a few of the more important crops and see where they are grown. In a later chapter you will learn of the Natural Regions into which our country can be divided. The following tables show you the proportion of crops in the different regions. The regions are marked on Fig. 41.

(*a*) *Rice.*—The whole of the Ganges and Brahmaputra Valley produces 16,000,000 (sixteen millions) tons of rice every year, coming from the natural regions as follows:—

Upper Ganges Valley	1,000,000	tons
Middle Ganges Valley	4,000,000	,,
Brahmaputra Valley	1,000,000	,,
Deltas	10,000,000	,,

Fig. 31 shows this more clearly. Compare Fig. 31 with what you have learnt of the climate of the Ganges Valley. We find that in the dry Upper Ganges Valley (with a rainfall of less than 40 inches) wheat is everywhere more important than rice. Very often barley too is more important than rice. This region would probably produce no rice at all were it not for the irrigation. In the Middle Ganges

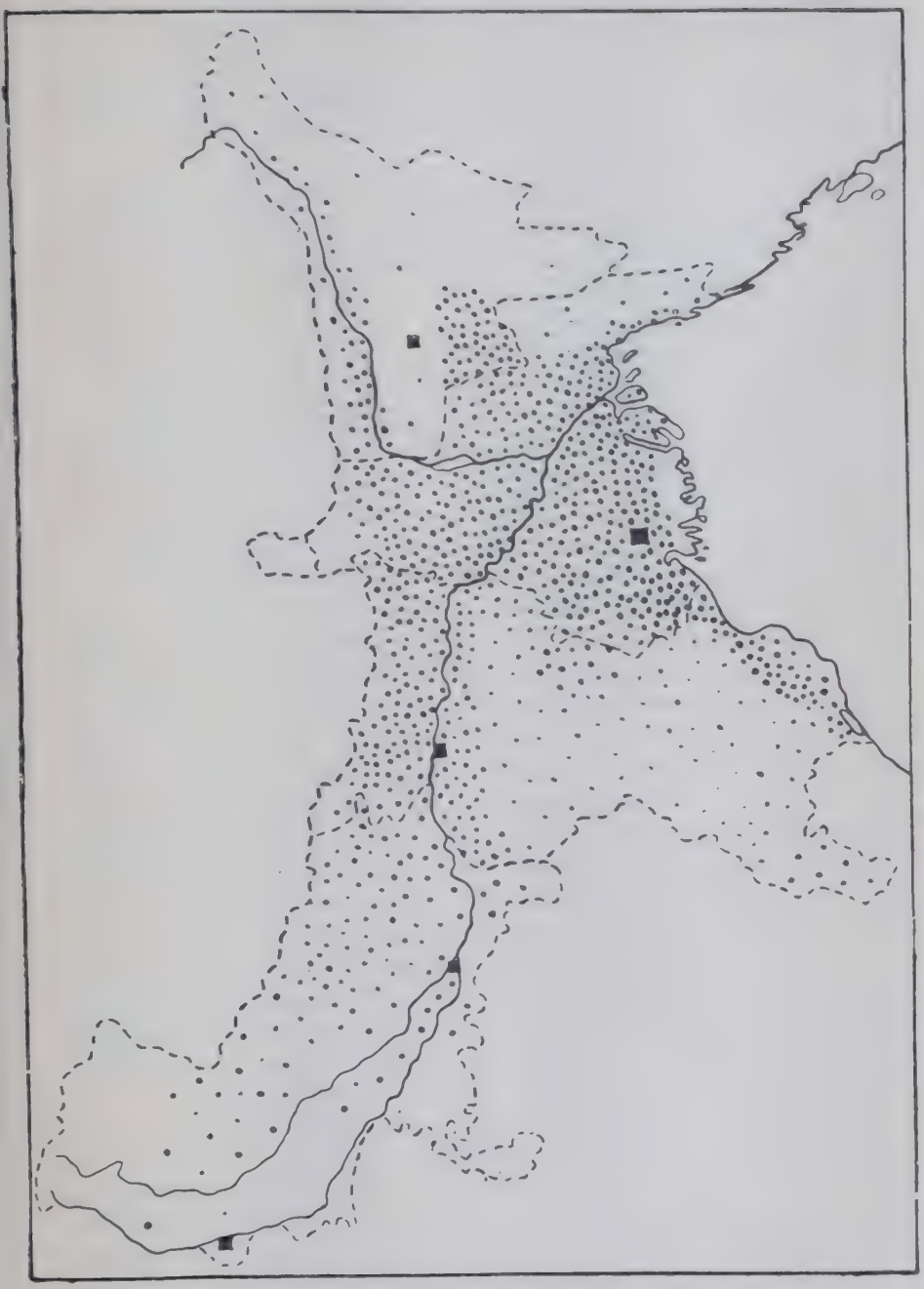

FIG. 31.—Sketch-map showing the distribution of rice. Each dot means 50,000 acres of rice.

Valley there is a great mixture of crops but rice is always slightly more important than either wheat or barley. The further we go eastward, that is towards wetter regions, the more important is the rice until we reach the Delta where it is practically the only food crop and occupies three-quarters of the whole cultivated area.

Although the eastern hills and the Chota Nagpur Plateau have a climate suitable for rice, they are hilly regions and rice can only be grown on small patches of level ground, or where the hill-sides have been carefully carved into a series of terraces or steps.

There are three main rice crops. The most important is reaped from November to January (*aghani* or *aman* or winter rice). In order to bring this crop to maturity it is the rains at the end of the rainy season which are important. If they fail the whole crop may be ruined although the early part of the rains may have been good. Autumn or early rice (aus) is reaped from July to September whilst a poor kind (boro or spring rice) is reaped about April.

(*b*) *Wheat.*—Wheat is a grain which is very much valued by white races and forms their principal food. Most parts of the world now grow wheat and send it to Europe to feed the enormous number of people engaged in industry there. Wheat in India is a winter crop. It is sown at the end of the rains and ripens at the end of the year before the great heat of the hot season commences. Unlike rice, wheat requires only a moderate amount of water and it would be killed if covered by water as rice is. Look at Fig. 24 and notice where the 40 inches rainfall line crosses the Ganges Valley. Nearly everywhere to the west of that line (where the rainfall is less than 40 inches) wheat is the most important crop. As we travel down the Ganges Valley into wetter regions wheat becomes less and less important and it disappears altogether when we get into Bengal and the rainfall reaches over 60 inches.

(*c*) *Barley.*—Barley is another important crop which grows largely in the same districts as wheat.

(*d*) *Millet.*—Millet is a small grain which forms the main or as we say 'staple' food of the people in all the drier parts of India. There are several different kinds, the two principal being cholum or *jowar* and cumbu or *bajra*. Where the rainfall is less than 40 inches millet is everywhere

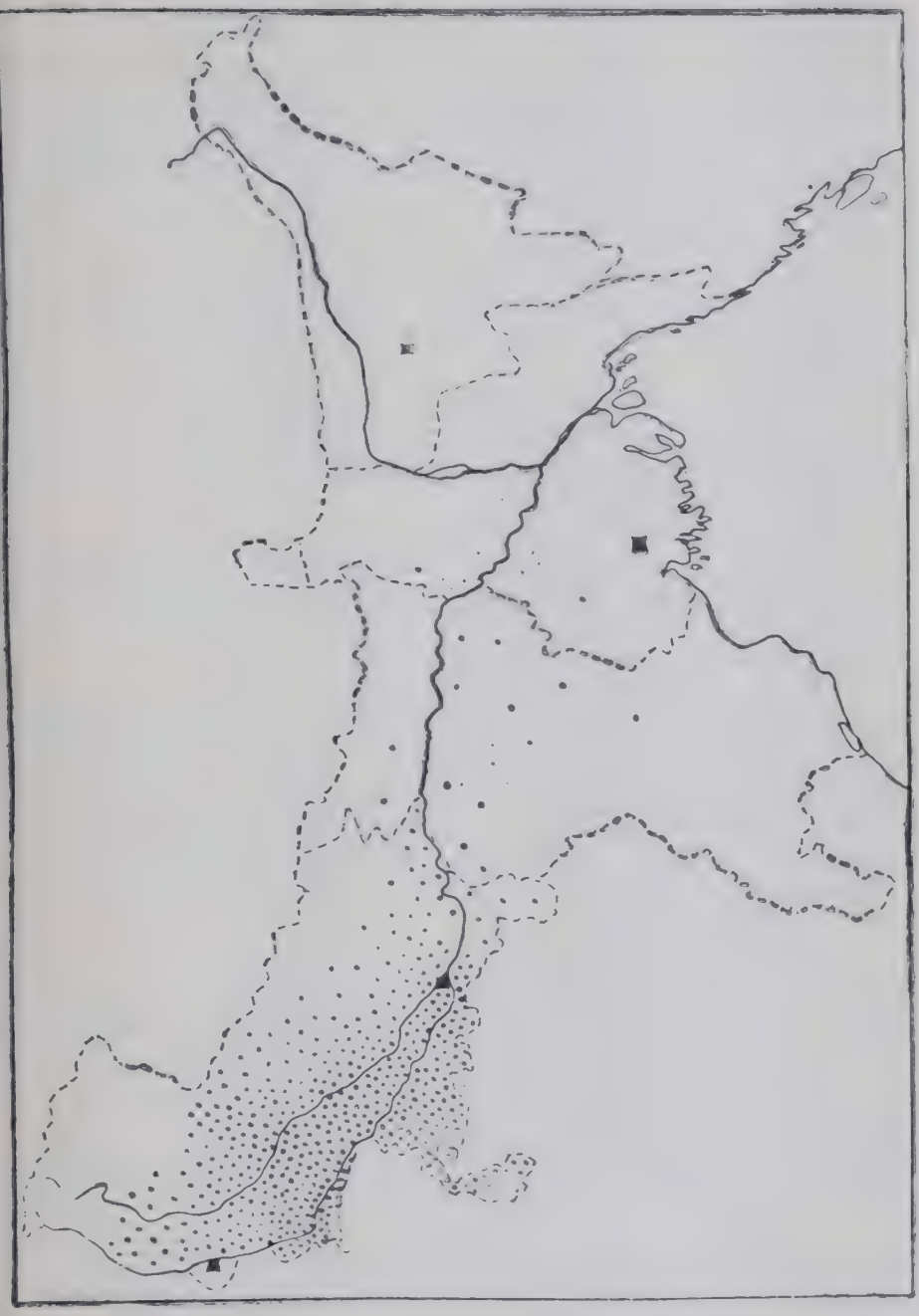

FIG. 32.—Sketch-map showing the distribution of millet. Each dot means 10,000 acres of millet.

important, but when the rainfall exceeds 40 inches it quickly disappears.

(*e*) *Maize.*—Maize is grown both for its grain ('Indian Corn') and as fodder for cattle. In India it flourishes both on the plains and in the hills where the rainfall is moderate. We find it with millet in dry regions, but also in damper regions too, but in the Lower Ganges Valley with a rainfall of 60 inches it disappears.

(*f*) *Pulses.*—Pulses of many different kinds are cultivated throughout the country. The most important is gram which affords a good food as well as fodder for cattle and horses.

(*g*) *Sugar-cane.*—Sugar-cane is grown in all the provinces of India, but most comes from the irrigated land of the Upper Ganges Valley in the United Provinces. From it jaggery is made.

(*h*) *Jute.*—Among the crops not grown for food, jute is by far the most valuable. It is grown all over the Lower Ganges Valley and the Delta. It yields very strong fibre from which nearly all the sacks in the world are made. It is a plant of very wet lands, like rice.

(*i*) *Cotton.*—Cotton is a dry region crop and is most important in the Upper Ganges Valley. The cotton itself is obtained from hairs on the seeds. When the seed-pods open, the seeds inside are seen to be wrapped in a mass of cotton fibres. The value of the cotton depends on the length of the hairs and there are many different kinds. Most of our Indian cotton has short hairs or as we say is a 'short-stapled' cotton.

(*j*) *Oilseeds.*—Plants grown for the sake of the oil obtained from their seeds include linseed, rape and mustard. They grow best with a medium rainfall, on slightly hilly regions like the border of the Chota Nagpur Plateau.

(*k*) *Tea.*—The tea plant is a shrub which requires a heavy rainfall, but must be grown on hill slopes. The hill slopes bordering the Brahmaputra Valley in Assam yield most of the tea but some is grown on the Himalayan slopes near Darjeeling and near Dehra Dun.

(*l*) *Tobacco.*—Soil is more important than rainfall to tobacco and it grows best on rich alluvial soils or the river banks. A little is grown in most districts and in some places enough is grown to be exported.

FIG. 33.—Sketch-map showing the distribution of wheat. Each dot means 10,000 acres of wheat.

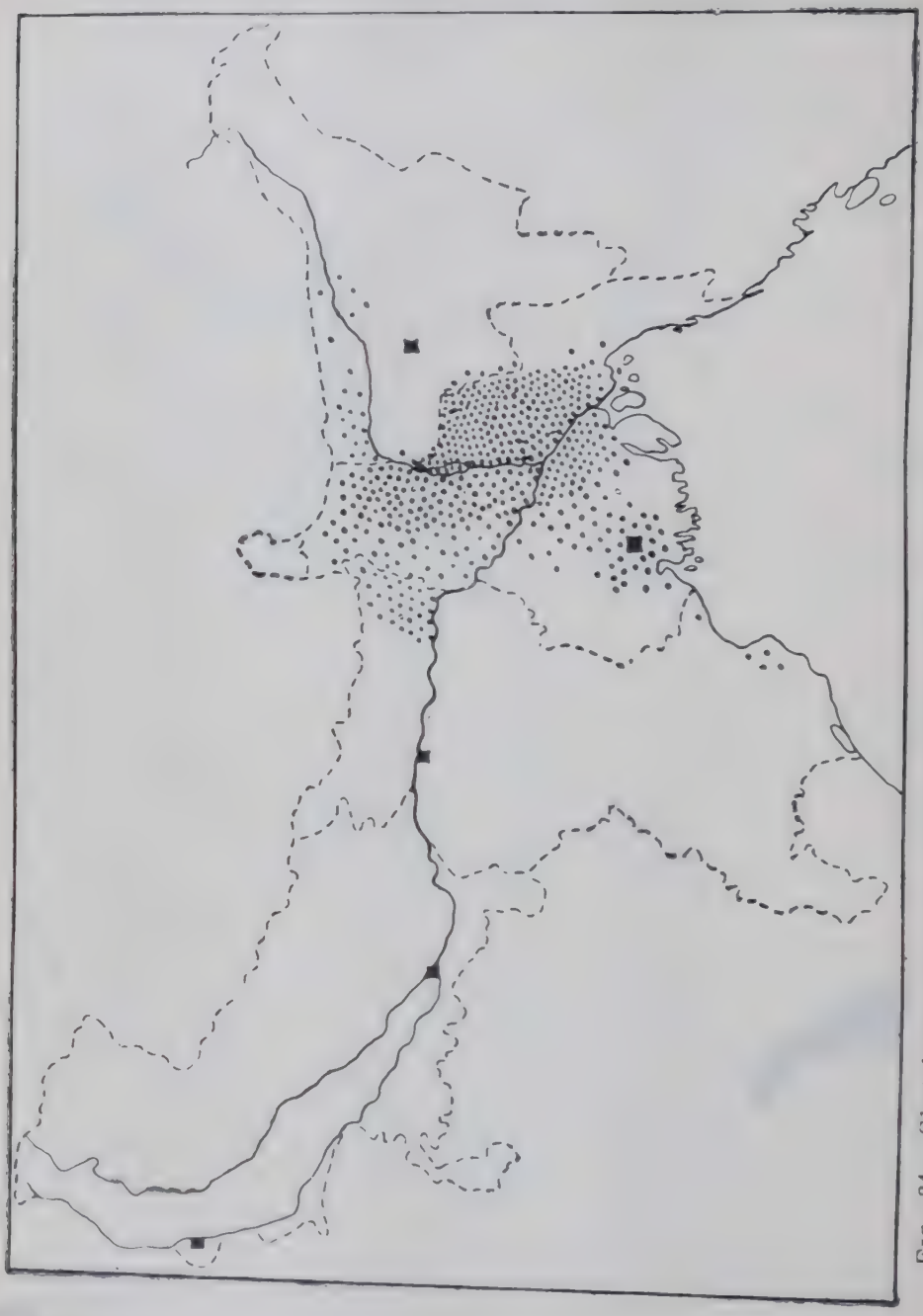

FIG. 34.—Sketch-map showing the distribution of jute. Each dot means 5,000 acres of jute.

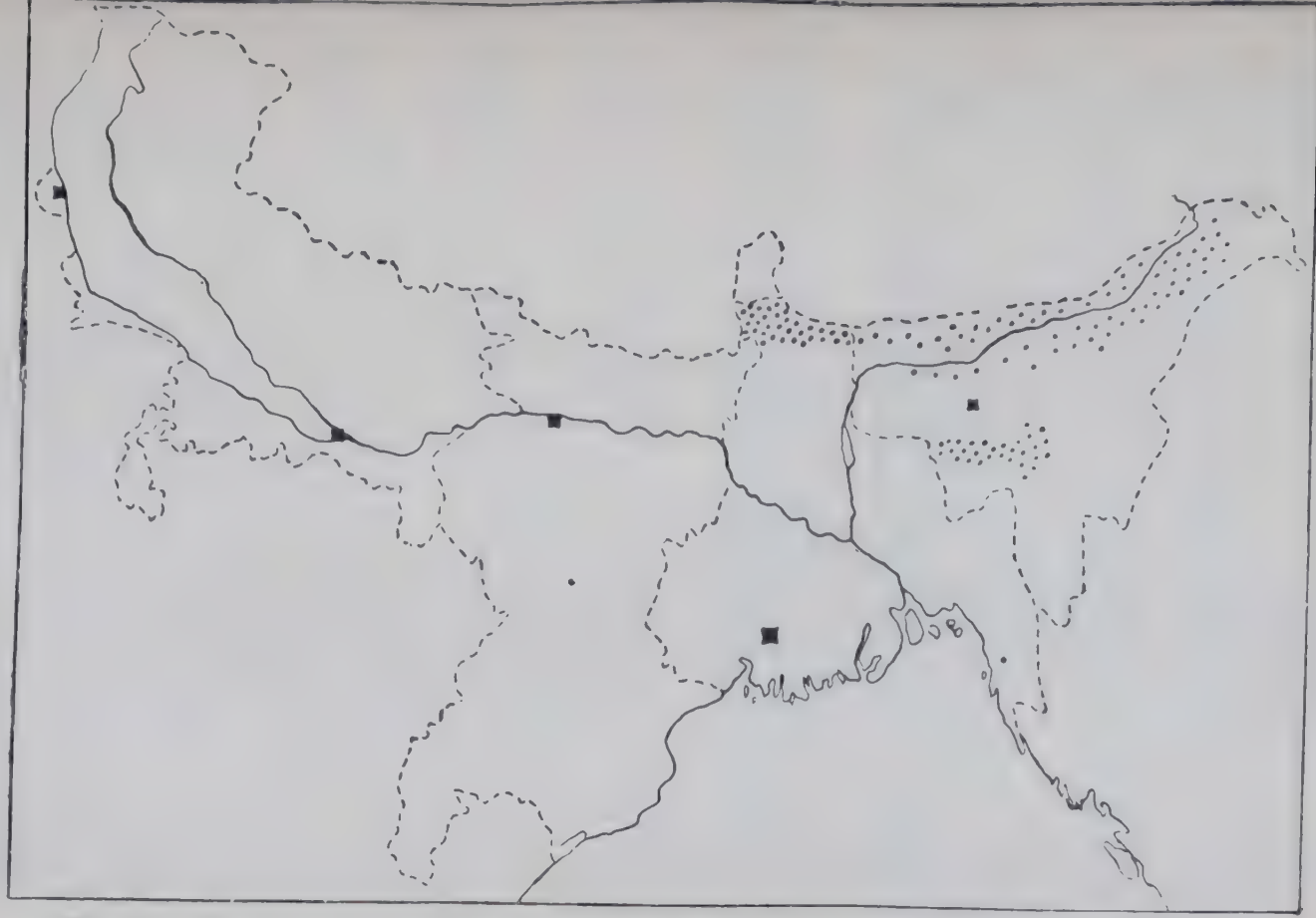

FIG. 35.—Sketch-map showing the distribution of tea. Each dot means 5,000 acres of tea.

At the end of this book in 'Useful Tables' you will find figures for other crops.

Study carefully the little maps showing the distribution of crops. Try to understand in each case *why* the crops grow where they do.

5. Closely connected with agriculture and crops are the animals which man keeps to be of service to him as food (meat of cattle, sheep and goats), to provide drink (milk from cows and goats), to provide clothing (wool from sheep, leather from skins of cattle) or as beasts of burden to draw carts, ploughs, etc. (cattle and horses). In the 'Useful Tables' at the end of this book you will find a statement of the numbers of these 'domestic animals' found in each province, together with the numbers of ploughs and carts.

Oxen.—There are seventy million oxen in the area we are studying, that is roughly one bull or bullock or cow for every two people. The oxen are found all over the country fairly evenly distributed, but the wet regions of Bengal have most.

Buffaloes.—There are twelve million buffaloes in North-eastern India, by far the largest number being found in the drier regions (United Provinces) and fewer in the wetter regions of Bihar and Bengal.

Sheep number four million and far more than half are found in the dry regions of the United Provinces, where they can live on grass or waste land which is not good enough for cattle.

Goats (twelve million) are to be found everywhere.

Horses and Ponies number less than one million, and show you that horses are not used for ploughing as they are in other parts of the world.

Mules and Donkeys are most useful in the hills and in dry regions. So we find there are less than 2,000 in the wet Province of Bengal and more than half of these are in the Darjeeling Hills. In the dry United Provinces mules and donkeys are much used and there are 300,000 of them.

Camels.—The camel is called the ship of the desert, because it can travel across deserts, going for long periods without water, and has broad feet which do not sink into the desert sand. So we find camels increase in number as we travel from wet Assam and Bengal (which have

practically none) and the dry United Provinces which have 20,000.

Ploughs.—There are twelve million ploughs in the four provinces—roughly one plough for every eleven men, women and children.

Carts are used everywhere except in the hills and in the wettest regions.

QUESTIONS AND EXERCISES

1. Draw a map of North-eastern India shading those parts which produce: (*a*) wheat; (*b*) tea.
2. Where are the most valuable forests of North-eastern India and why—Chota Nagpur Plateau, Upper Ganges Valley, Garo Hills, Himalaya Mountains from 5,000 to 12,000 feet?
3. What parts of the following plants are useful to man:—
   Maize, tobacco, tea, cotton, rape, barley, millet, pulses? What is each used for?
4. Draw two sketch-maps of North-eastern India, one showing the rainfall and one showing the useful forests. What do you notice?

CHAPTER VIII

POPULATION

1. Man's needs consist chiefly of two things, namely, food and clothing. In North-eastern India, the food which most people eat is rice, with vegetables and, sometimes, meat. The clothes people in India wear are cotton clothes, silk clothes, or woollen clothes. If we ask ourselves, 'Where do these things come from?' we see that the woollen clothes are made from the wool of sheep which live on grass growing on the ground; the silk comes from the silk worm which lives on the leaves of bushes and trees which grow in the ground; cotton comes from a plant, and the rice, wheat, maize, and vegetables that we eat also grow in the ground. Meat comes from animals and birds which live on things which grow on the ground. In short, man depends for his life on the soil and the vegetation which it produces.

In civilized countries, men use many things which are made by machinery, from metals found in the ground, such as railway engines and carriages, ships, motor-cars. They also use leather, machine-made cloth, etc.—things made in large factories from materials provided by plants and animals. Thus, not only do they depend upon the productions of the soil, but also upon the productions of machinery, which they themselves can make and control.

2. Now, since man gets much of his food and clothing from the earth, he grows all the things he needs, grass, rice, cotton, wheat, and so on, in fields where he can see after them and grow considerable quantities. This is 'agriculture,' and we find that where the soil is good and the climate suitable there are many crops grown and men live close together. In many cases, more crops are grown and more cattle and sheep are reared than are required for the use of the people who live in that place. When this happens, the extra produce is sent away to other people

who are without these things, because their soil and climate are not suitable, or because there is no room in their country for them to be grown. In return, these people send the cultivators things made by machinery. Thus, the peoples of the world can be divided into two classes, the people who grow things, and the people who make things. In its simplest form, trade consists of the exchange of food for manufactured articles. We have already given the name of 'agriculture' to the growing of things; the name given to the making of things is 'industry'.

It will generally be found that agriculture and industry go on together in all countries, but in every case, either the one or the other is the more important, so that each country can be classed as an 'agricultural' country or as an 'industrial' country.

3. All parts of the world are not crowded with people, or, as geography books say, they are not all thickly populated. In agricultural and in industrial districts there will be thick populations, but where the soil and climate are not suitable for agriculture, and where there is no coal or iron or other metals for industries, there will be very few people. We may, therefore, draw a map of the World, and mark on it the places where people live close together, that is, the areas of thick population. This has been done in Fig. 37. Then we can draw another map and mark on it the countries where the people are chiefly engaged in agriculture and the countries where the people are engaged in industry. This is done in Fig. 36. Looking at the map we can see the 'food suppliers' of the world, and the chief 'makers' of the world. When we compare the two maps we see that the thick population is found not only where the climate is good for agriculture, but also where manufactures are carried on. India is one of the 'food suppliers,' and one food it supplies is rice. (Look again at Fig. 36.) We can now realize from Fig. 36 that India is not a country all by itself, cut off from the rest of the world by its high mountains and the sea, but that it takes its place in the world, and more particularly in the Empire, as a supplier of food, receiving in return the things it needs made in industrial countries.

4. When we speak of India as an agricultural country, we must remember that the whole of India is not taken up

FIG. 36.—Map of the World, showing agricultural and industrial regions. Industrial regions black, agricultural regions lined.

FIG. 37 —Where people live. Map of the World, showing thickly populated regions. All parts in black have more than 8 persons living on each square mile of ground.

by fields, because the soil and climate are not everywhere suitable. The unsuitable parts of India will have but few people; therefore, while the districts suitable for agriculture will be thickly populated, there will be very few people in the hilly or forest regions. Thus, if we take Fig. 30 and shade darkly those parts marked 'cultivated land,' and shade lightly all the rest of North-eastern India, we shall have a rough map of the population of the country. This will be a very inaccurate map. In order to understand the geography of our country properly, we must have something more definite.

Every ten years, the Government counts all the people living in all parts of the British Empire. This counting is called taking the Census. There was a Census in 1921. The results of the Census are printed in tables, and, in order to learn something of the population of India, we use the Census Tables.

The total area of the country we are studying is about 375,000 (3·8 of a million) square miles and the number of people 150,000,000 (one hundred and fifty millions), so that if the people were spread out equally all over the country there would be 400 persons living on each square mile of ground; but we know that in some places houses and villages are very close together, while in others we can travel for miles without meeting a single person, and this shows us that the people are not equally spread about over the country. In other words, parts of North-eastern India are thickly populated, while other parts are thinly peopled; we can now find out which parts of our country these are.

If we could place a dot on the map for every person, we should be able to see at once where all the people are, but it is not possible to put 150,000,000 dots on a small map, so we will put one dot for every 25,000 persons, placing each dot on or near the place where the 25,000 people it represents actually live. This is done in Fig. 38. It shows clearly which parts of North-eastern India are thickly populated, and which are thinly populated. Study the map carefully, and you will see that the people have gathered most thickly in the Delta, along the river valleys and along the coast. The other parts of the North-eastern India are only thinly peopled. We can learn a great deal by comparing this map with Figs. 4, 8, 11, and 24.

FIG. 38.—The population of North-Eastern India. Each dot means 25,000 people. Towns with more than 50,000 people marked by square dots.

Before reading any further, study carefully each of these maps together with the population map (Fig. 38) and write down all that they teach you about the reasons for the distribution of population in North-eastern India.

You will find that most of the people of India live :—

(*a*) on the low lands ;

(*b*) on the alluvial rocks ;

(*c*) both in the good-rainfall and in the dry-zone districts ;

(*d*) where artificial vegetation is greatest.

The most important thing of all is the fact that population is the densest in the agricultural areas. Now look at the little insets showing the distribution of population in England, and the agricultural areas of England. You will

FIG. 39.—Population of England and Wales.

FIG. 40.—Agriculture in England and Wales.

see that whereas in India the people are densest in the agricultural areas, in the case of England the population is thickest outside the districts where agriculture is the chief occupation. These maps prove that India is among the 'Agricultural Countries', the 'food suppliers' mentioned on page 67, while England is among the 'Industrial Countries,' the 'makers'.

Agriculture is the determining factor in the distribution of population in most parts of North-eastern India except where there are coal-fields and around Calcutta where we find factories.

5. Nearly all the races in North-eastern India have come into the country from the north-west along the Ganges Valley, but some came in very early days from China and Tibet through the gaps or passes in the Mountain Wall and along the Brahmaputra Valley. The early inhabitants of the country and the first invaders from China were very backward peoples. Later more civilized peoples invaded the country and drove out the others from the fertile plains and made them run away to live in the hills. So we find the most backward peoples still living in the hills—in the Chota Nagpur Plateau, the Eastern Hills Region and the slopes of the Himalayas. The invaders who settled in the plains are of very varied race and so the people living in the Ganges Valley are, as we say, very mixed. We can best classify the people of North-eastern India into the following groups :—

(1) The tribes of the Chota Nagpur Plateau. These tribes represent the original inhabitants of India. Many of them are still wild, uncivilized people. The Santals are the most important tribe.

(2) The hill tribes of the Himalayas and the Eastern Hills Region. These tribes are the remains of the people who came from Tibet and China. They have flat faces like the Chinese, usually with very little hair on their faces. Some of them have eyes shaped like a Chinaman's, and some have a yellowish brown skin. The Lepchas and Nepalese are examples.

(3) The Bengalis live mainly in the Delta and lower Ganges Valley. Some of them are Hindus by religion, others Muhammadans. They are quick to learn and like to work with their minds rather than with their hands.

(4) The Biharis are stronger, less quick to learn, but with good memories. They are hard workers ; in the rains they work in their fields, in the cold season many of them go into Bengal to work on the railways or in the docks. Their home is in Bihar.

(5) The Oriyas are small slender men, but very strong and able to work very hard.

6. Let us now look at the different languages spoken in our country.

(*a*) There are the languages which are very like those spoken long long ages ago by the original inhabitants of

India and called 'Dravidian Languages.' They are used by many hill tribes of the Chota Nagpur Plateau. Other tribes in the same area speak various 'Munda Languages' which are also very old. Munda languages are very curious, very long words are made by adding together a lot of short ones so that sometimes one word means the same as a long sentence does with us.

(*b*) There are the languages which are spoken by the peoples who came from China and Tibet. We find these languages in the Eastern Hills Region and over most of Burma. They are rather like Chinese.

(*c*) The other languages—by far the most important in our country—are called Indo-European languages. They were brought into India by the invaders who came down the Ganges Valley, but we must remember all languages change after a long period of years. Bengali is spoken over nearly the whole of Bengal and a very large part of Assam. Bihari, Hindi and Urdu are separate languages, but they are often called 'Hindustani.' Hindustani is spoken all over the United Provinces and Bihar and Orissa, except where Oriya is spoken.

When people become civilized and travel about, it is very difficult if they cannot understand one another. So we find there are certain languages very much used over large areas. The most important is English, which is spoken or understood by educated people over more than half the world. Over the North of India and many more places Hindustani is used by many people although it is not their native language.

7. We must now study a little about the different religions of the people of our country. In Assam and Bengal, that is amongst the Bengali, very roughly half are Hindus and half Muhammadans. In the Middle and Upper Ganges Valley Hindus are much more numerous. The hill tribes of the Chota Nagpur Plateau, Eastern Hills Region and Himalayan slopes have various small religions of their own. In all parts there is a considerable proportion of Christians.

8. We have now studied North-eastern India as a whole from the points of view of position in the world, structure, climate and the effect of these on its vegetation and people. In the next and following chapters we shall

divide the country into parts and study each part in greater detail.

QUESTIONS AND EXERCISES

1. Find from your atlas and Fig. 37, the names of all the more densely peopled parts of the world.
2. Explain why most of the people of England do not live in the agricultural districts.
3. Make two lists, one of the names of the chief countries which are ' makers ' and one of those which are chiefly ' feeders '.
4. Draw a sketch-map of North-eastern India and show by shading where the principal languages are spoken.
5. Find from ' Useful Tables ' at the end of this book the number of people who speak your own language. Draw diagrams to show how many people speak the other languages of this part of India.

CHAPTER IX

NATURAL REGIONS

1. We have seen that North-eastern India may be divided into parts which differ widely from one another in physical features, climate and productions. If we compare a Naga living in the Naga Hills or a Nepalese in the Himalaya Mountains with a cultivator living at Patna or Dacca, we see that they live in different climates (look at Figs. 14 and 15) that the one when he travels to the next village, has to climb high hills and cross narrow valleys, while the other probably travels by boat (look at Fig. 5) and that while the Naga lives partly by hunting and partly by growing maize and millet, the way in which the other man earns his living is probably connected with rice in some way (look at Figs. 31 and 83). Or again if we compare a man living at Delhi with a man living at Cherrapunji, we find the one lives in one sort of climate (dry) and does one sort of work while the other has another kind of climate (very wet) and another way of earning his living.

If we are to understand the geography of North-eastern India clearly we must divide the country into divisions, seeing that each division we make has more or less the same sort of surface, a similar climate and similar productions. Such divisions are called the Natural Regions of a country, because they are the divisions into which the country is divided by Nature. You will say that North-eastern India is already divided into Assam, Bengal, Bihar and Orissa and the United Provinces. But these divisions are no use to us for geographical purposes, because they are not based on surface or climate or productions ; they are not Natural Regions. Government divides the country into 'Provinces' and 'Divisions' and 'Districts', but they are not natural divisions. In 1905 and again in 1912 Government completely altered all its 'Provinces' in this part of

India, but we can never really alter the Natural Regions of a country.

2. Looking at Fig. 8 we see at once that one of the Natural Regions is the great Mountain Wall formed by the Himalaya Mountains and occupying a great part of Nepal, Sikkim and Bhutan. This region we shall call the Himalayan Mountain Region.

We shall learn later that between the fertile valley-plains of the Ganges and the Brahmaputra and the great mountain chains of the Himalayas there is a tract of land quite different from either. It includes gently sloping ground and also some of the lower ranges or 'foothills' of the Himalayas. We shall call this Natural Region the 'Sub-Himalayan or Sub-Montane Region.'

Looking again at Fig. 8 we notice the numerous mountain chains which bound our country on the east and separate it from Burma. This area of mountainous country includes Garo and Khasi Hills of Assam which stick out from the main mass. We shall call the whole of this mountainous tract the 'Eastern Hills Region.'

Turning now to the south-west, we notice a plateau region, about 2,000 feet above sea-level. This constitutes the 'Chota Nagpur Plateau Region.' Further east the plateau land in the southern part of the United Provinces is much drier and forms part of the 'Central Indian Plateau.'

We must now consider the different areas of low land. There is firstly the Brahmaputra Valley—the part of it in Assam—constituting one Natural Region.

If we look at the broad Ganges Valley we find it forms one physical region but the climate at one end is very different from the climate at the other. We must therefore divide it into

(*a*) the Upper Ganges Valley, stretching roughly as far as the town of Allahabad and with a rainfall of less than forty inches;

(*b*) the Middle Ganges Valley; and

(*c*) the Deltas Region—which we shall be able to divide into three parts.

There is still one other part to be considered. It is a narrow coastal strip between the Chota Nagpur Plateau and the sea—the Orissa Coastal Strip.

FIG. 41.—The Natural Regions of North-Eastern India.

H.=Himalayan Region.
S.H.R.=Sub-Himalayan Region.
B.V.=Brahmaputra Valley.
E.H.=Eastern Hill Region.
D.=Deltas Region.
M.G.V.=Middle Ganges Valley.
U.G.V.=Upper Ganges Valley.
C.I.P.=Central Indian Plateau.
C.N.P.=Chota Nagpur Plateau.
O.C.=Orissa Coastal.

These then are the Natural Regions of North-eastern India :—

(1) The Himalayan Mountain Region—very mountainous (Fig. 8), wet (Fig. 24) and cool owing to its height (Figs. 14 and 15).

(2) The Sub-Montane Region—undulating or hilly (Fig. 8), moderately wet (Fig. 24), unhealthy and somewhat thinly peopled (Fig. 38).

(3) The Eastern Hills Region—very hilly (Fig. 8), very wet (Fig. 24), thinly peopled (Fig. 38).

(4) The Brahmaputra Valley—narrow (Fig. 8), wet (Fig. 24), cultivated (Fig. 30).

(5) The Orissa Coastal Strip—small, flat (Fig. 8), moderate rainfall (Fig. 24), densely populated (Fig. 38).

(6) The Chota Nagpur Plateau—hilly (Fig. 8), moderate rainfall (Fig. 24), thinly peopled (Fig. 38), largely covered with forest (Fig. 30).

(7) The Central Indian Plateau—hilly (Fig. 8), dry (Fig. 24), much waste land.

(8) The Upper Ganges Valley—flat (Fig. 8), dry (Fig. 24), thickly populated (Fig. 38).

(9) The Middle Ganges Valley—flat (Fig. 8), moderately rainy (Fig. 24), thickly populated (Fig. 38).

(10) The Deltas—flat (Fig. 8), very wet (Fig. 24), thickly populated (Fig. 38).

Fig. 41 is a map of North-eastern India showing these Natural Regions.

3. When Fig. 41 is compared with Figs. 38 and 30 it is clearly seen that the Ganges Valley Regions are the most important. A very large proportion of these lands is cultivated and the population is very large. The little coastal strip of Orissa is also important, but it is very small The three hilly regions—the Himalayas and the Sub-Montane Region and the Eastern Hills are the least important and have the smallest number of people. Man has done less there to alter natural conditions than he has done in the other regions and we find that forests are large and important.

When we have clearly grasped these natural regions of North-eastern India and the geographical reasons for dividing the country up into these ten parts, we will turn once more to the Census Tables to see what they can tell us, and then go on to study each of the regions in detail.

From the Census Tables we can find out how many people live in each of the natural regions, and those regions which have the greatest population are, of course, the most important, because the study of geography is really the study of man and his work. This is what the Census Tables tell us. [1]

Natural Region	Size	Population	Density
Himalayan Mountain Region.	...	...	About 50
Sub-Montane Region ...	...	...	About 150
Eastern Hilis Region ...	35,000	1,300,000	37
Brahmaputra Valley ...	25,000	4,000,000	160
Orissa Coastal Strip ...	8,000	4,000,000	500
Chota Nagpur Plateau ...	67,000	12,500,000	186
Central Indian Plateau ...	10,000	2,000,000	200
Upper Ganges Valley ...	44,000	22,000,000	500
Middle Ganges Valley ...	41,000	22,550,000	550
The Deltas Region ...	84,000	50,400,000	600

We must now proceed to study each region and discover the geographical reasons for the differences between each.

QUESTIONS AND EXERCISES

1. What do you understand by a Natural Region ?
2. Draw from memory a map of North-eastern India showing the Natural Regions.
3. Why is not the Ganges Valley one natural region ?
4. Which are the rainiest regions of North-eastern India ? The most thickly populated ?
5. Take each of the natural regions shown in your sketch-map (Question 2) and explain in what ways each one is different from all the rest.

[1] These figures are very approximate only.

6. Explain why it is necessary to divide a country into Natural Regions for purposes of geographical study.

7. Find from your atlas another region in the world like (1), (3), (5), (6), (7), (8), (10).

8. Fill up this table :—

Natural Region	Surface	Rainfall (very wet, moderate, dry)	Population (very dense, moderate, thin)

CHAPTER X

THE HIMALAYAN REGION

1. We are now going to learn something about the great wall of mountains which shuts off India on the north. The word ' Himalaya ' means the ' abode of snow ' and refers to the coat of snow which never leaves the high mountains. Unless you live somewhere near the foot of the mountains, you have probably never seen snow and it must be very difficult to picture what a great mountain covered with snow looks like. But perhaps you have been to the bioscope and seen pictures with snow there.

In order to find out what the Himalaya mountains look like, let us make a journey up to Darjeeling. You know that in March, April and May it gets very, very hot and you find it difficult to work in school. So difficult it is that most of you have holidays from school at that time. You can imagine it must be still harder for Europeans, who are used to a much colder country, to live on the plains during the Hot Season. And so they have built a town high up in the mountains, 7,000 feet above the plains below, where they can go and work during the Hot Weather. You have learnt in Chapter IV why it is much cooler in the hills. This town in the hills, called Darjeeling, is reached by a little mountain railway. If the railway had not been built it would take us many days to climb high hills, covered with forest, cross deep narrow valleys and climb still more hills before we could reach Darjeeling. But now the little railway takes us up the 7,000 feet in a few hours. Away from the railway, cart-tracks are very few and travelling is measured not by miles, but by the number of hours required for the journey. The little mountain railway has rails only two feet apart (we call this a 2-foot gauge) and starts from the plains, which although 300 miles from the sea, are there less than 400 feet above the level of the sea. From there the railway winds about amongst the forests of the Sub-Montane Region. After it has climbed 5,000 feet we pass out of the tropical

FIG. 42.—The Himalayan and Sub-Himalayan Regions—Western Half. Notice the line of towns and the railway along the borders of the Sub-Himalayan Region. Notice the line of Hill Stations on the nearest high ground (above 5,000 feet). The Himalayan Region comprises roughly the land over 5,000 feet (dark). Land between 1,000 and 5,000 feet light. All peaks marked △ are over 20,000 feet.

forests and the different kinds of trees remind us that we are now in the Himalayan Region. Still we wind about amongst forest covered hills, getting steadily higher and higher till at last we reach Darjeeling more than 7,000 feet above the level of the sea. Let us suppose we have been fortunate and arrived on a day when the air is fine and clear. Away to the north we see a wonderful vision of giant mountains covered with snow. In the far distance to the north-west we catch a glimpse of Mount Everest, the highest mountain in the world. Mount Everest, which is over 29,000 feet high, seems to be only one of a long chain of peaks stretching east and west and forming the axis or main chain of the mountain range. Nearly everywhere the height of the ridge is 18,000 or 19,000 feet. Standing apart from the chain we see Kinchinjunga, the third highest and perhaps the most magnificent mountain in the world. It looks higher than all the others because it stands by itself.

If we look to the east and to the west from Darjeeling we see a broad belt of mountains, not so high as the ones to the north, but still very big. These form the Lower or Outer Himalayas. We can thus divide the Himalayan Regions into two parts :—The main Himalayan Range and the Lower or Outer Himalayas. A third part, the Sub-Montane Region or the Sub-Himalayan Region you learn about in a separate chapter.

2. Let us now take a journey from Darjeeling and learn something about the Himalayan Region. This part of the Himalayas catches the full force of the South-west Monsoon and the rainfall is very heavy—more than 100 inches. If we go further west it gets rather less for the monsoon wind has to blow great distances across the land before it reaches the mountains, but everywhere it is good. Even at Simla, just outside the western limit of the area we are studying in this book it is 63 inches. If we stand on one of the hills near Darjeeling we can see the clouds rolling up from the sea in the Bay of Bengal. We are so high that we are above the clouds and when they strike against the mountains we find ourselves enveloped in a thick white mist and everything around us is hidden. That is what it feels like to be in a cloud and for half the year the Darjeeling hills are covered by such mists. As we go on our journey the vegetation around us is everywhere very

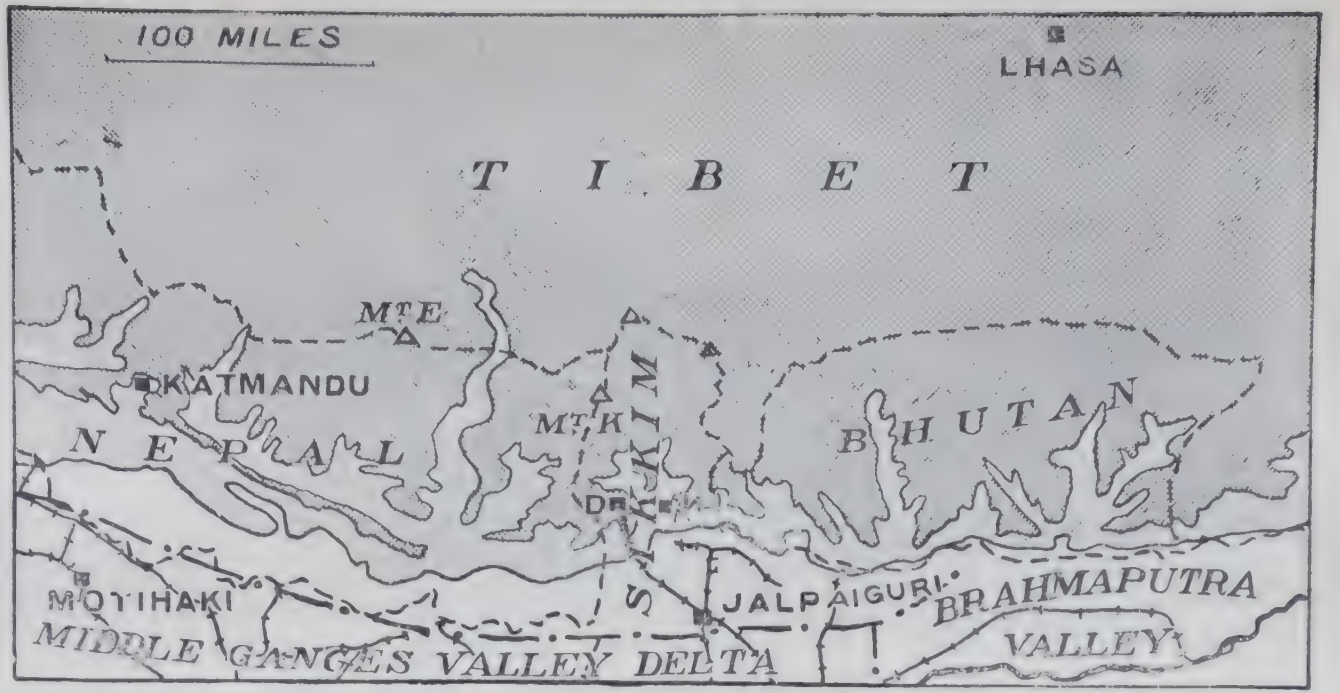

FIG. 43.—The Himalayan and Sub-Himalayan Regions, Eastern Half. See notes on Fig. 42.
Mt. E. = Mt. Everest ;
Mt. K. = Kinchinjunga ;
D. = Darjeeling ;
K. = Kalimpong.

rich. The forest consists of broad-leaved evergreen trees, of which different kinds of oak are the most important. When we climb higher and reach more than 9,000 feet above sea-level the forest becomes quite different and our path winds through beautiful and stately pine trees. Some of them are so large that two men could scarcely make their hands meet around the trunk, and these trees are straight as a ship's mast. Their leaves are very narrow-shaped like large needles and the ground beneath the trees is covered with brown 'pine needles' and pine cones, which give a fresh healthy scent to the air around. As we pass along, we notice that wherever the bark of the pine tree has been injured, thick resin oozes out and solidifies on the surface.

As we rise still higher we leave the pines and about 12,000 feet enter into what is called the Alpine Zone. Here the ground is covered with *Rhododendrons*, sometimes forming dense thickets, at other times forming trees with red twisted stems. The higher we go the poorer and smaller become the shrubs; much of the ground is covered only with tufts of mountain flowers or grass. Above us we see stretches of snow and if we are able to climb high enough we pass at 16,000 feet above sea-level into the land of everlasting snow. The 'snow-line' is the line above which the heat of the sun in the hot season is unable to melt the snow which falls in the cold season.

We have learnt from our journey that the Himalaya mountains can be divided into four belts, according to the vegetation and height above sea-level:—

(4) Snow	16,000 feet to the top of the mountain.
(3) Alpine Belt ...	12,000 feet to 16,000 feet.
(2) Coniferous Forest Belt ...	9,000 to 12,000 feet.
(1) Evergreen Oak Forest Belt ...	5,000 to 9,000 feet.

Although the forests are dense and contain many different trees yet they are of little commercial value at present. They are too far away. It is difficult for a man to get from the hills to the plains and, therefore almost impossible for him to haul trunks of trees to those places where they can be sold. The cost of getting at the timber,

or other forest products such as resin, is so great that it does not pay to try, and so the forests are left to themselves, except where they are nearest to the plains. In the colder parts of the world such as Norway, Sweden, Russia and Canada there are great pine forests like those on the Himalaya Mountains but growing near sea-level and so easily reached. Most of the boxes in which goods from foreign countries are brought to India are made from the wood of these forests.

3. In our journey through the mountains we have not seen many people. In the whole natural region there are less than 100 people to the square

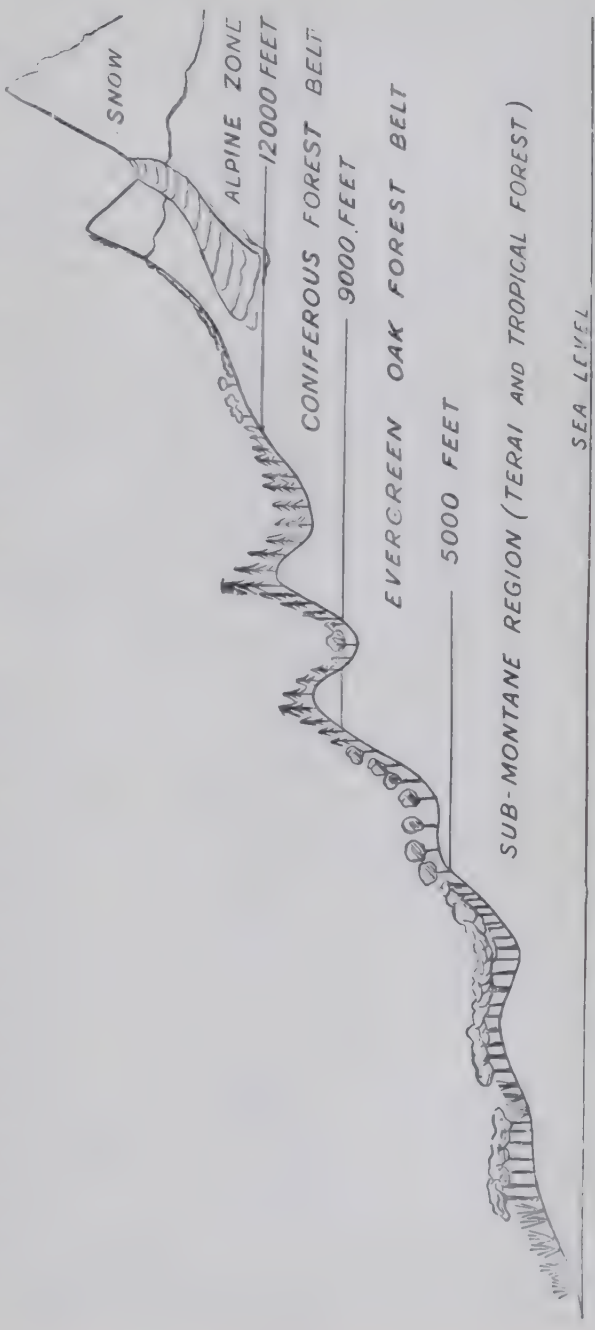

FIG. 44.—The Vegetation Belts of the Eastern Himalayas.

mile, usually much less. The State of Sikkim, for example, has only thirty people to the square mile. We have, however, noticed a few villages scattered amongst the hills. The villages are not large, but consist of just a few huts and each village is surrounded by a patch of cultivation. The people burn down a small piece of jungle and the ashes make the soil rich for a short time. A few crops such as maize are grown, but after a year or two the people move away and clear another patch of fresh jungle. Often they move their village too. The villagers look quite different from us. They are small but strong, have rather flat faces and make us think of Chinamen. They speak many different languages and the people in one village often speak a different language from those in the next. They can understand one another, however, because they can both use another language—Nepali. The most important hill tribes in the Himalayas are the Nepalese. The ruling race in Nepal is the Ghurkhas, small sturdy men who make very good soldiers. In the State of Sikkim, which is part of British India, the Lepchas and Bhotias are important tribes. We often meet too, Tibetans and others who have travelled over the mountains from Tibet. We find that the people, although they live amongst the mountains, do not like cold and the Lepchas especially usually build their villages in the warmer valleys.

It is impossible to live in the very highest parts, even if men can stand the cold. You have learnt that the air gets thinner as we ascend and at great heights is so thin that man cannot breathe. He has to take a big bottle of compressed air or oxygen with him. No one has ever been able to climb to the top of the highest mountains.

4. There are many things which we can learn in the mountains and which we cannot understand easily if we live in the plain. Let us stop for a moment and look at one of the rivers in the Himalayan Region. It is a roaring, rushing torrent at the bottom of a deep V-shaped valley—quite different from our quiet rivers of the plains. Its floor is strewn with big stones and boulders which the stream is pushing gradually downwards, knocking them against one another and breaking off pieces and rounding the bigger ones. Gradually the stones are worn smoother and smaller. The little pieces which are broken off form

sand and the smaller pieces are just like mud. When after a long journey this fine material reaches the plains it will form the alluvium which we know so well. Here in the mountains we can see the alluvium in the process of formation. Let us follow up the mountain torrent and find its source. It will take us many days of hard travelling for we shall find the stream has many waterfalls up which we must climb and the forest on either side is dense. After a long time the forest becomes thinner and we emerge into the Alpine Zone. We are now very high up and the air feels very cold. We put our hand in the water of the stream and find it as cold as ice. If we go on a little further we may find that our stream is flowing from a hole in a mass of ice. We climb up on to the ice and find that it stretches right away up into the mountains as a river of ice. Such a frozen river is called a glacier. As we stand on it it does not seem to move, but if we could watch it from day to day we should find it moving gradually downhill and melting to form the river. On either side of us rise rugged mountains, partly covered with snow, but with steep slopes of bare rock. At the bottom of the steep slopes are piles of broken rocks, rough pieces of all shapes and sizes. Piles of rock at the bottom of steep slopes like this are called 'screes.' How do they get there? Well, water gets into the cracks of the rocks of the mountains and during the cold night freezes. Water when it freezes expands or grows larger and so the crack in the rock is made bigger. When the water melts or thaws again a big piece of rock will fall off and down into the valley. So we see the high mountains are gradually cut away by the action of 'frost' freezing the water in the cracks. Some of the pieces may fall on to the glacier and be gradually carried down into the river valleys. Read again what you have read about 'Rain and Rivers' in Chapter II.

5. Some of the larger rivers have succeeded in cutting valleys through the great mountain wall. The River Brahmaputra has a long course in Tibet, and then turns south and cuts right through the mountain wall. Further east the Arun River also cuts through. Outside the limits of the area we are studying, to the north-west, the River Sutlej does the same thing. There are other places where the mountain wall is not quite so high and where men are

able to cross from one side to the other. Such places where man can cross are called passes. One of the most important passes is reached from Darjeeling and leads to the city of Lhasa, the capital of Tibet. At the eastern end of the Himalayas there are passes into China.

Natural Regions do not take any notice of political boundaries and we find that only a small part of the region we are now studying is in British India. The western part is included in the United Provinces. Here is the little State of Garhwal and part of the District of Dehra Dun with the hill-station of Mussoorie. Going eastwards the Himalayan Region lies in the State of Nepal, till we reach the District of Darjeeling and the State of Sikkim which projects northwards from Bengal. Further east the Region forms part of Bhutan, and the eastern end lies in Tibet.

6. There are few industries in this region. Darjeeling as well as being an important hill-station is also the centre for numerous tea gardens. There tea is grown on the hill slopes. Further east is Kalimpong, through which town wool is imported from Tibet. Nepal is not part of India; its capital is Katmandu.

QUESTIONS AND EXERCISES

1. Describe the natural vegetation of the Himalayan Region.
2. Describe the climate of Darjeeling.
3. Write an account of the people of the Himalayan Region.
4. How are rocks worn away in mountain regions?
5. Find another Natural Region in the world like this one.

CHAPTER XI

THE SUB-MONTANE OR SUB-HIMALAYAN REGION

1. Between the broad cultivated plains of the Ganges or Brahmaputra Valley and the Mountain Region of the Himalayas there is a belt of country which is very different from either. In some places it is flat or gently waving land only slightly above the level of the plains, but at other places it includes separate ranges of hills—the foot hills of the Himalayas. Such ranges of hills are the Siwalik Hills in the northern part of the United Provinces, the Churia Ghati Hills in the southern part of Nepal, the Dun Hills in Northern Bihar, and the Sinchula Hills in Northern Bengal.

The Sub-Montane belt is bounded on the south by the cultivated plains of the Ganges or Brahmaputra valleys; on the north it extends to a height of 5,000 feet in the Himalayas where it passes into the Himalayan Region. In the chapter on the Himalayan Region you learn tha the swift mountain streams there are busily breaking up the rocks into small pieces—pebbles and sand. Often the descent to the low ground is sharp and there the streams spread out and deposit a 'fan' of gravel and sand. Much of the Sub-Montane Region consists of sand deposited in this way. Very often we can divide the Sub-Montane Region into two distinct strips. The part nearest the flat plains of the Ganges is only slightly raised above their level. This strip is often covered with coarse, tall grasses and is known as the 'Terai.' Near the Himalayan range we come on to a belt of hills, usually covered with forest, damp and unhealthy. These hills do not as a rule exceed 4,000 feet; behind them rise the healthy hills belonging to the Himalayan Region. It is interesting to note how man has been controlled by physical geography in building his towns. On the borders of the Terai and the Ganges Plains we find a long line of towns—Saharanpur, Pilibhit, Kheri, Bahraich, Motihari, Jalpaiguri, etc. Find these on the map. For considerable distances a railway runs along

the line between the two natural regions. These towns mark the northern limit of the fertile Ganges plains, but from thereon cultivation is now being gradually extended into the Terai. On the other side of the Sub-Montane Region we find a line of hill-stations. The hills of the Sub-Montane Region are unhealthy, so we find the hill-stations are built on the first line of hills belonging to the Himalayan Region. Examples are Simla, Mussoorie, Naini Tal and Darjeeling. Study Fig. 43*a* carefully. It shows you a section drawn from the plains, through the Sub-Montane Region into the Himalayas.

The Sub-Montane Region occupies considerable areas in the United Provinces; along the south part of Nepal and along the borders of Nepal and Bihar and Orissa; in Northern Bengal and the borders of Bhutan where the 'Terai' country is known as the 'Duars.' The rainfall varies from 40 or more inches in the west to well over 100 in the east, but there are marked local variations some valleys being almost dry, whilst some hill ranges have a very heavy fall.

2. The characteristic vegetation of the more hilly parts of the Sub-Himalayan Region is a Monsoon Forest of the valuable sal trees. This forest stretches right from the west to the east but over large areas it is interrupted by tracts of coarse grass such as occur on the Terai. The Terai is covered with coarse grass or coarse grass with scattered trees. Grass land with scattered trees is called Savannah.

In the west there are numerous patches of dry thorny forest, in the wetter east there are patches of very damp evergreen forest. In the wet east it is found that the dry sal forest occurs on the ridges, rich wet tropical evergreen forest in the valleys.

3. The Sub-Himalayan Region is very unhealthy and the inhabitants suffer greatly from fever. So we find the region is thinly populated, the chief inhabitants are forest tribes who live and make their scattered clearings in forest and grass land. Gradually, however, man is draining the damp unhealthy places, and conquering diseases. In the United Provinces much of the Terai is now cultivated and thickly populated; in Northern Bengal are rich tea gardens. The sal forests are both important and valuable. There are very few towns in this area. Buxa guards the approaches

to Bhutan and Dehra Dun at the western end is one of the headquarters of the Forest Department in India and the site of the Forest School is here. A famous and sacred place is Hardwar, where the River Ganges leaves the mountains. Cultivation is being pushed into this region from the line of towns on the borders of the plains and parts of it are now being extensively used. Let us turn once more to the census tables and see what they can teach us about this region. We can mark on our maps the extent of the region and then look for the figures of sub-divisions lying right inside. We find that in the north-western part of the United Provinces there are but few people—150 to the square mile. But further east cultivation has been pushed much further into the Terai, and the population rises to 500 per square mile. In Northern Bengal it is about 300 (Jalpaiguri). What can we learn,

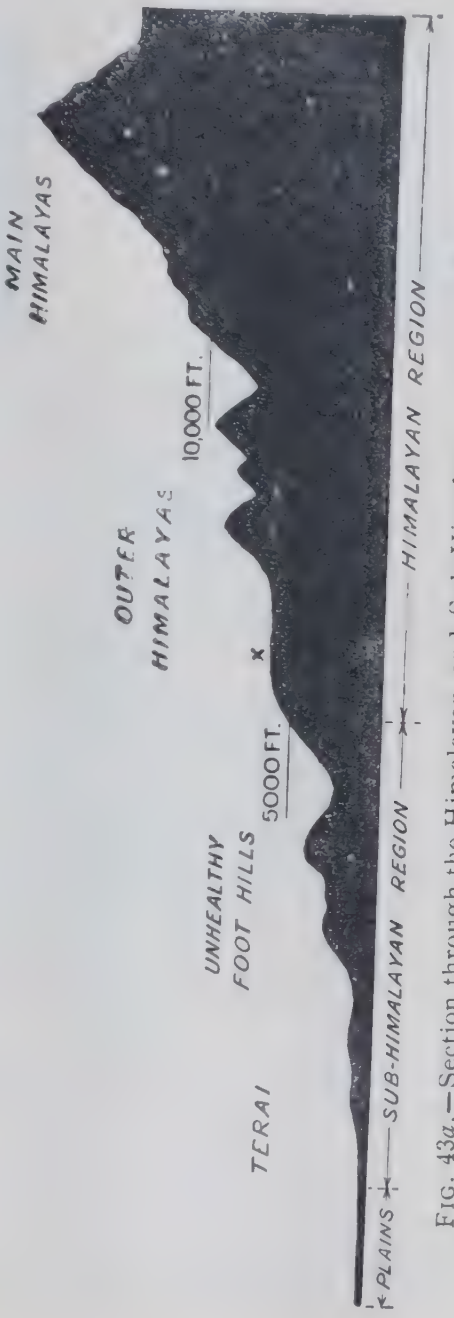

FIG. 43*a*.—Section through the Himalayan and Sub-Himalayan Regions. X = lowest healthy mountains where the hill-stations are built.

too, about the amount of cultivated land? We find that most of the 'districts' made by Government cover part of

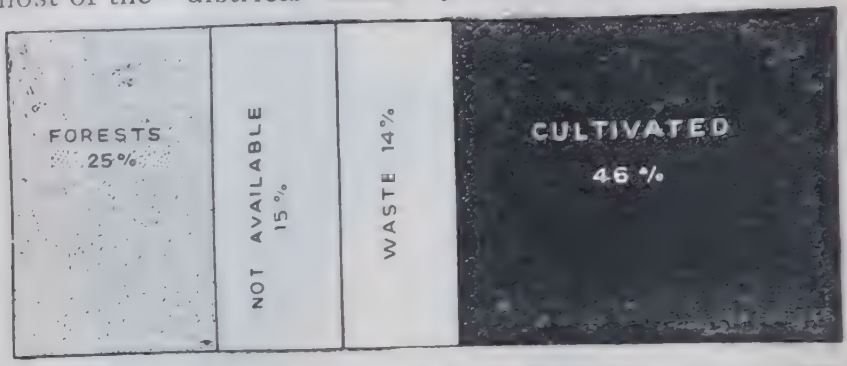

FIG. 45.—Proportion of cultivated land in the wetter eastern part of the Sub-Montane Region (Jalpaiguri and Darjeeling).

the Sub-Montane Region and part of the Plains Region and so it is difficult to separate the two in Government Reports. If we take two districts in the west which are almost entirely in the Sub-Montane Region and two in the east

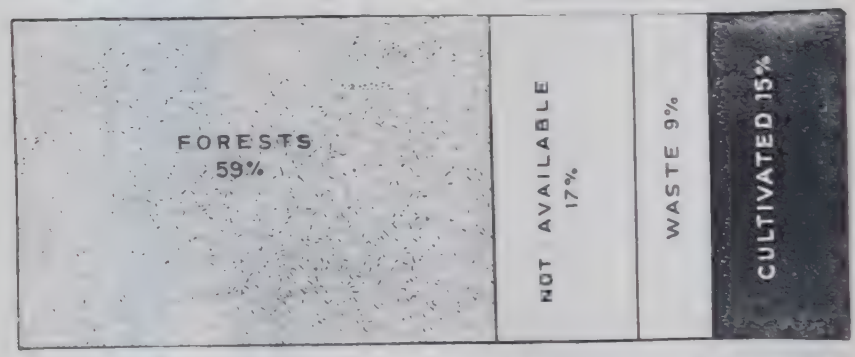

FIG. 46.—Proportion of cultivated land in the drier western part of the Sub-Montane Region (Dehra Dun and Naini Tal).

which are also in this region, we notice in both the large area of forest, a moderate proportion of waste land and a moderate to good proportion of cultivated land.

QUESTIONS AND EXERCISES

1. Compare the Sub-Montane Region with the regions which occur on either side.

2. Draw a sketch-map showing the distribution of sal forests in North-eastern India.

CHAPTER XII

THE EASTERN HILLS REGION [1]

1. From Fig. 47 we see that the Eastern Hills Region sweeps south-westwards from the far corner of Assam,

FIG. 47.—The Eastern Hills Region. Land over 1,000 feet dotted, over 3,000 feet black.

where it is known as the Patkoi Hills and broadens out forming the Naga Hills and including the State of Manipur.

[1] Comprising a large part of Assam, the districts of Garo Hills, Khasi and Jaintia Hills, parts of Cachar and Sibsagar, Naga Hills, Manipur and Lushai Hills, also Chittagong Hill Tracts of Bengal.

Here the main mass of hills swings southwards forming the Lushai and Chin Hills and Chittagong Hills, passing southwards into Arakan. From the region of the Naga Hills a big branch runs out almost due west forming the Khasi and Jaintia Hills and the Shillong Plateau of Assam and finishing up as the Garo Hills. Notice from Fig. 8 how the Eastern Hills Region is separated in the north from the Himalaya Mountains by the Brahmaputra Valley. Everywhere the Eastern Hills Region forms the 'Mountain Wall' between India and Burma. Narrow in the north it gets broader in the centre and then begins to get narrower again.

One of the chief considerations which make the Hills Region a separate part of India is that it is very difficult to get into the hills. It is easy to move about the Valley Regions because one can sail on the Ganges, or go by railway from place to place; one can also travel by bullock-cart from one village to the next. But to get into the Hills Region we have to climb from the plains or the Delta up the sides of steep hills, clothed with thick forest, or follow the rocky valleys of small streams; and, when we have left the plains below and are into the hills, we find that the country consists of small narrow valleys separated by steep ranges of hills, so that in whatever direction we wish to move we have to toil up and down, along narrow jungle paths, many of which are too steep and difficult even for ponies or mules. Because it is so difficult to get into the Hills Region, the people of the plains have little to do with the people of the hills, and, in the same way the people of the hills rarely come down to the plains. The hill people have kept themselves often quite apart and, generally speaking, have not progressed nearly so much as the people who live in the plains.

2. In order to find out what the Eastern Hills Region looks like, let us climb up amongst the Lushai Hills. Everywhere the slopes of the hills are clothed with thick wet jungle, either tall evergreen forest or a thick tangle of canes and bamboo. As we go we find leeches clinging to our legs and drawing blood. After climbing over a number of ridges covered with forest we find ourselves on a high ridge covered with grass. We are able to see the hills around us and we notice that they are all long

ridges running from north to south with long valleys between. We look in the far distance and see higher hills, but nowhere do we see snow-covered mountains. Read what is said about the Himalayan Region and notice the differences. The hills we see in the distance are only about 7,000 feet high—the highest hills are not much higher than Darjeeling which is only on the fringe of the great Himalayan Chain. Let us walk along the narrow grassy ridge and notice the forests on either side. They are wet and evergreen, but they are different from the forests we passed through on the lower slopes and consist largely of oak trees. Perhaps in some places we may see patches of pine forest. These are found from 4,000 to 4,500 feet above sea-level.

We have not met many people on our journey, but here and there we see their villages, each surrounded by a patch of cultivated land. We notice that many of the villages are situated on spurs, near a spring in the hillside, but well situated in case of attack.

Further north than where we have been, the Eastern Hills Region is broader, and in the centre occupying a plateau surrounded by hills is the State of Manipur. Manipur is sheltered by the surrounding ring of hills and has only just over 60 inches of rain. Its soil is fertile and a good quantity of rice is grown—some is actually exported.

3. Let us now take a journey to another part of the Eastern Hills Region. We will visit that part which juts out from the rest and forms the hills of Assam. We can reach nearly to the foot by a railway which takes us to Sylhet. Then we commence to climb. The hills are here facing the south and receive the full force of the South-west Monsoon. The places on this southward facing slope are some of the rainiest places in the world. Cherrapunji has nearly 500 inches of rain a year and in one year nearly 1,000 inches of rain fell. If the rain water remained where it fell, there would be sufficient for the biggest steamer in the world to float after only one season's rain. When we have passed Cherrapunji we find ourselves on a plateau, called the Shillong Plateau. We pass the crest and the plateau slopes gently to the north and there is situated the town of Shillong. Notice that Shillong is sheltered

from the main force of the monsoon and so has a rainfall of only 83 inches although Cherrapunji with nearly 500 inches is only thirty miles away. Study Fig. 29 carefully to see why this is so. The Assam Hills are more cultivated than the other parts of the Eastern Hills Region. On the slopes down towards the Brahmaputra Valley, we find some of the numerous tea plantations for which Assam is famous. You will learn about these in the chapter on the Brahmaputra Valley.

In all parts the Eastern Hills Region has plenty of rain so that drought is unknown; but many regions are spoilt by having too much. The rain falls so heavily that it washes the seeds out of the ground and sometimes washes all the plants out of the ground too.

4. Look carefully at Fig. 48 and notice what a very small proportion of the Hills Region is cultivated. A part of it is covered with valuable forest, amongst which are the

FIG. 48.—Proportion of cultivated land in the Eastern Hills Region. Cultivated land in black (4 per cent)

sal forests found especially on the Garo Hills. But the greater part of the region is covered with forests which are too far away to be of any use or with waste land of bamboo, canes and grass. Although such a small proportion of the area is cultivated, nine out of every ten persons are engaged in agriculture. That will help you to realize how few people live in the Hills Region—only about thirty-seven for every square mile. Look at Fig. 38. Now study Fig. 49 and notice that rice is the most important crop. Some of the more advanced hill tribes make terraced fields for their rice, but most of them simply burn down a

piece of jungle, cultivate a few crops and then move to some other spot. Although the climate of the hills is wet,

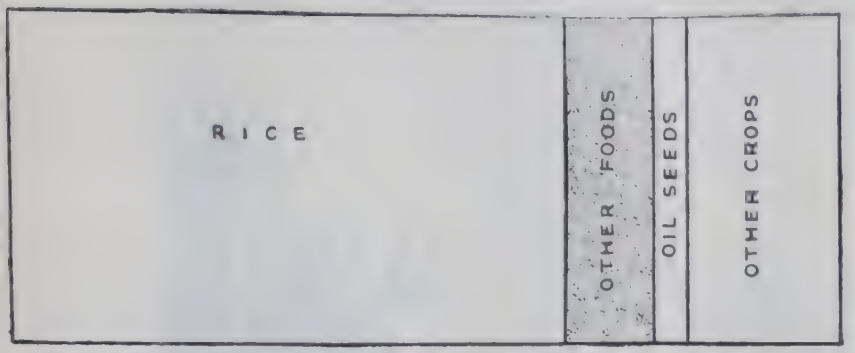

FIG. 49.—The crops of the Eastern Hills Region. 'Other foods' include maize; 'other crops' include cotton (especially in the Garo, Lushai and Chittagong Hills) and a small area of tea (in Chittagong and Tripura State).

there is a coarse kind of cotton which will grow and we find it especially in the Garo, Lushai and Chittagong Hills. Some fruit trees such as oranges can be grown and are being tried in the Garo Hills.

The Eastern Hills Region consists largely of old hard rocks, but the only mineral industry of importance is quarrying limestone and making lime in the Khasi Hills.

The Eastern Hills Region is inhabited by various hill-tribes who like the hill-tribes of the Himalayas and the people of Burma are more allied to the Chinese than to the Indians. Especially in the Garo Hills we find settlers from other parts of India, notably from Bihar, are coming and cultivating the land. Many of them have worked in the tea gardens of the Brahmaputra Valley.

5. We must now consider the roads into the hills. There is now a railway joining the upper part of the Brahmaputra or Assam Valley and the plains of the Delta, running as far as the port of Chittagong. This railway cuts across the hills as shown in Fig. 47. It has two short branches on the south side—one to Sylhet from where we can approach the rainy south slopes of the Assam Hills. Shillong, the principal town of Assam is more easily reached from the north side from the railway running along the Brahmaputra Valley. Gauhati is the river-port on the

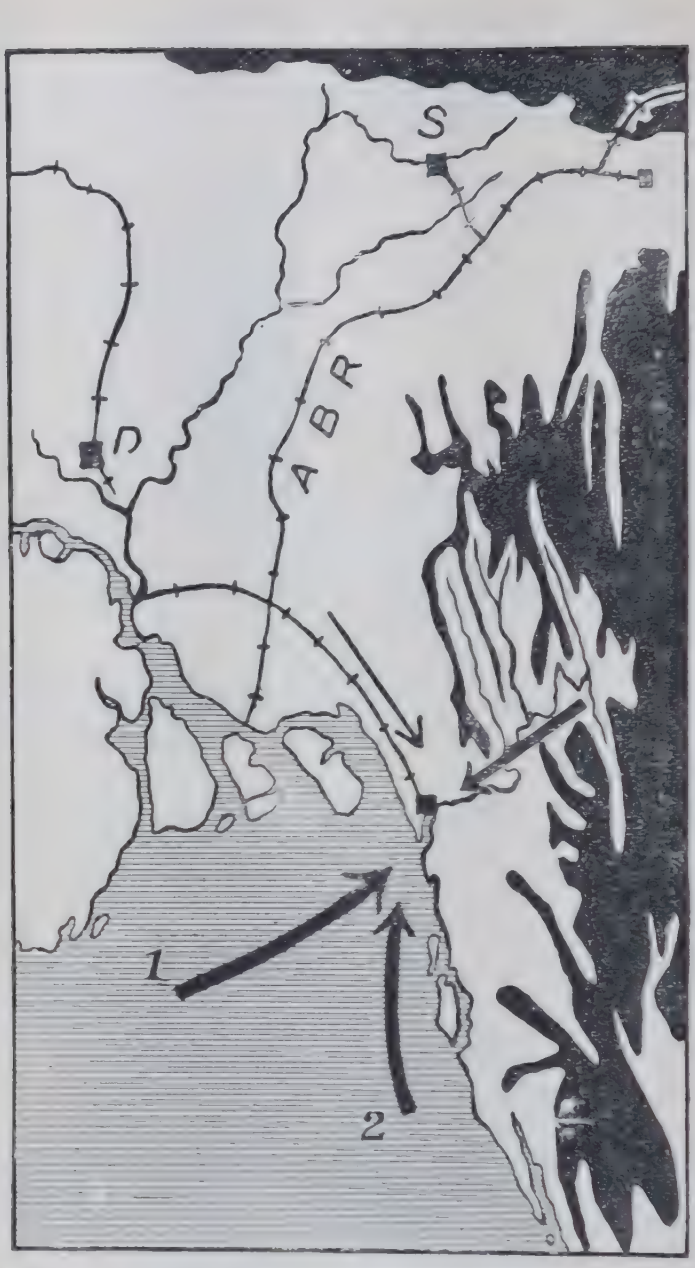

FIG. 50.—The position of Chittagong. Notice the small hinterland surrounded by high hills (all land over 1,000 feet in black). The Assam-Bengal Railway does not connect with any other great railway of India.
1. From Calcutta. 2. From Akyab and Rangoon.
D = Dacca; S = Sylhet.

Brahmaputra for Shillong. The State of Manipur is reached by the important cart road from Dimapur ; perhaps one day a railway may run along the same route and continue on into Burma. Further north the Tuzu River from Burma forms a way by which the Hills Region can be approached from Burma. From the port of Chittagong several valleys run up into the Lushai Hills and Cox's Bazaar, also on the coast, is the outlet for the extreme south of the area.

QUESTIONS AND EXERCISES

1. Explain by means of diagrams the reason for the following differences in Rainfall :—Cherrapunji 486", Shillong 83', Gauhati 67" and Manipur State 63".
2. Write an account of the agriculture of the Eastern Hills Region.
3. Find another Natural Region in the world like this one.
4. How does this Natural Region differ from the Himalayan Region ?

CHAPTER XIII

THE BRAHMAPUTRA VALLEY

1. The Brahmaputra or Assam Valley is very different from the broad alluvial plains of the Ganges Valley. On the north side the lower slopes of the Himalaya Mountains are not far away, on the south side the slopes of the Assam Hills—the Garo, Khasi and Jaintia Hills—approach close to the river. Much of the flat land in the Brahmaputra Valley is used for rice-growing ; on the gentle slopes are the tea gardens for which Assam is famous.

The River Brahmaputra rises in the Plateau of Tibet and flows for a very long distance eastwards before breaking through the northern mountain wall into Assam. The

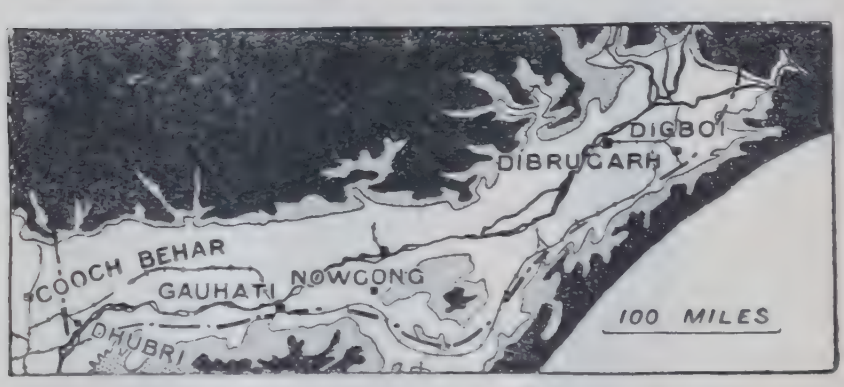

FIG. 51.—The Brahmaputra Valley. Notice the long narrow valley between the great mass of the Himalaya Mountains on the north and the Eastern Hills Region on the south and south-east.

Brahmaputra Valley in Assam is roughly 500 miles long, but only about 50 miles wide. The river itself is broad, it divides and reunites again many times. On either side there is often a waste marshy belt, but a little distance from the river are flat lands given over to rice-growing. Palm trees and villages are dotted about amongst the paddy fields ; further away from the river are found the gentle slopes covered with tea gardens. The Brahmaputra

receives many tributaries from either side, but none of them are important.

2. Look now at Fig. 24, the rainfall map and notice that a great part of the Assam Valley has a good rainfall of more than 80 inches, but in the centre there is a large oval patch where the rainfall is less than 80 inches. You have learnt in Chapter VI the reason for this drier patch ; it is because part of the Brahmaputra Valley lies in the 'Rain-shadow' of the Garo, Khasi and Jaintia Hills. Notice how these hills shelter the valley from the S. W. Monsoon. You should notice, too, that the Brahmaputra Valley is further north than the great plains of the Deltas Region and so is colder in the Cold Season (Fig. 14). In the Hot Season and the Rains, the sky is cloudy and so the land does not get so hot and dry as it does in the broad Upper Ganges Valley.

3. Look now at Fig. 52 and notice that a considerable part of the Brahmaputra Valley is cultivated. Near the great Ganges Plain (that is the Deltas Region or North Bengal) in the western districts of Goalpara and Kamrup the population is densest and more land is cultivated than

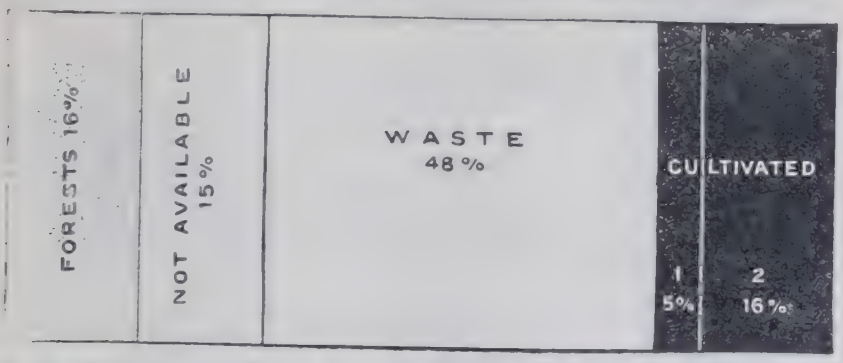

FIG. 52.—Proportion of cultivated land in the Brahmaputra Valley. Cultivated land :—(1) 'fallow' ; (2) 'sown.'

at the eastern end of the plain. But Fig. 52 shows you that there is still a large amount of waste land which might be cultivated. There are still only 150 people to the square mile, instead of 500 or more which we find in each square mile of the Ganges Valley or Delta Districts. Every year large numbers of Bengalis come from the more crowded parts of Eastern Bengal and settle in Assam.

Nepalis come from the Himalayas and find in the Assam Valley more fertile land. There are large numbers of Biharis employed in the tea gardens and every year many of them give up work in the tea gardens and settle down to cultivate the waste land of the Brahmaputra Valley and more Biharis come from Bihar and Orissa to take their places in the tea gardens. The population is thus rapidly increasing and the waste land is gradually being used.

4. Now let us look at the crops of the Brahmaputra Valley (Fig. 53). Rice occupies by far the largest area,

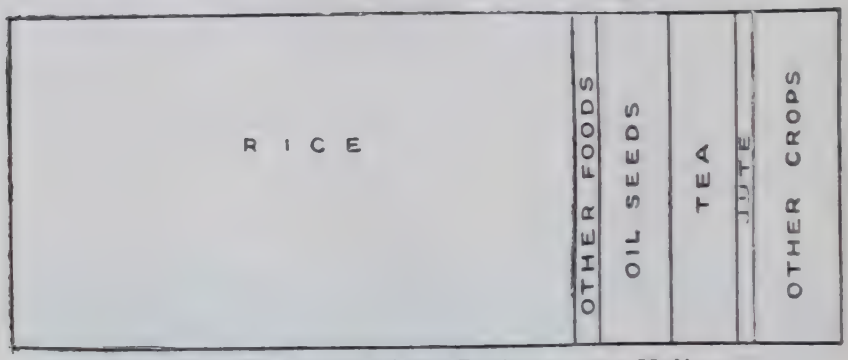

FIG. 53.—The crops of the Brahmaputra Valley.

and it forms the principal food of the people. Nearly all the rice produced is used by the people and there is little or none left over for sending to other countries. The second most important crop is tea. Tea is made by drying the young leaves of a small bush or shrub. The tea-bushes are planted in neat rows on gentle hill slopes on either side of the Brahmaputra Valley and these tea gardens give work to a large number of people in Assam. Nearly 120 people out of every 1,000 living in Assam work in the tea gardens and a great many of the workers are Biharis from Bihar. Look at Fig. 35 (map showing the distribution of tea) and notice that the tea gardens stretch beyond the Brahmaputra Valley westwards into the Sub-Himalayan Region in Northern Bengal—in Darjeeling and Jalpaiguri. The sides of the Brahmaputra Valley where the tea is grown are, indeed, very like the lower lands of the Sub-Himalayan Region. Notice too, that a considerable quantity of tea is also grown near Sylhet, on the borders of the Garo or Khasi Hills and the flat lands of the Surma

Valley. This is not of course, part of the Brahmaputra Valley, but the conditions are similar. Tea is a crop which is grown not so much for the people themselves as for sending to other countries and Assam sends a very large quantity of tea to Europe, especially the British Isles, where the people drink much tea.

Oilseeds form another important crop in the Assam Valley.

5. At the eastern end of the Assam Valley Region, on the borders of the Eastern Hills Region is the Oilfield of Digboi, and there is a small coalfield in this part of the region also.

Notice the railways of this Natural Region. The western end of the valley is connected with Bengal by a branch of Eastern Bengal Railway. Running along the eastern part of the valley, south of the river, is the Assam-Bengal Railway, but the two railways are separated by the broad Brahmaputra River at Gauhati. The Brahmaputra River is used by country boats for the greater part of its length. Notice the routes into the Eastern Hills Region—from Gauhati to Shillong there is a good motor road ; from Dimapur a cart road runs into Manipur State.

QUESTIONS AND EXERCISES

1. The population of the Brahmaputra or Assam Valley is increasing. Why ?
2. Write an account of the tea industry in North-eastern India.
3. Describe the climate of the Assam Valley.
4. The Brahmaputra River is longer than the River Ganges, yet its valley is much less important. Why ?

CHAPTER XIV

THE ORISSA COASTAL STRIP[1]

1. This 'Natural Region' is only a very small one, but we must remember that it is part of the long strip of low

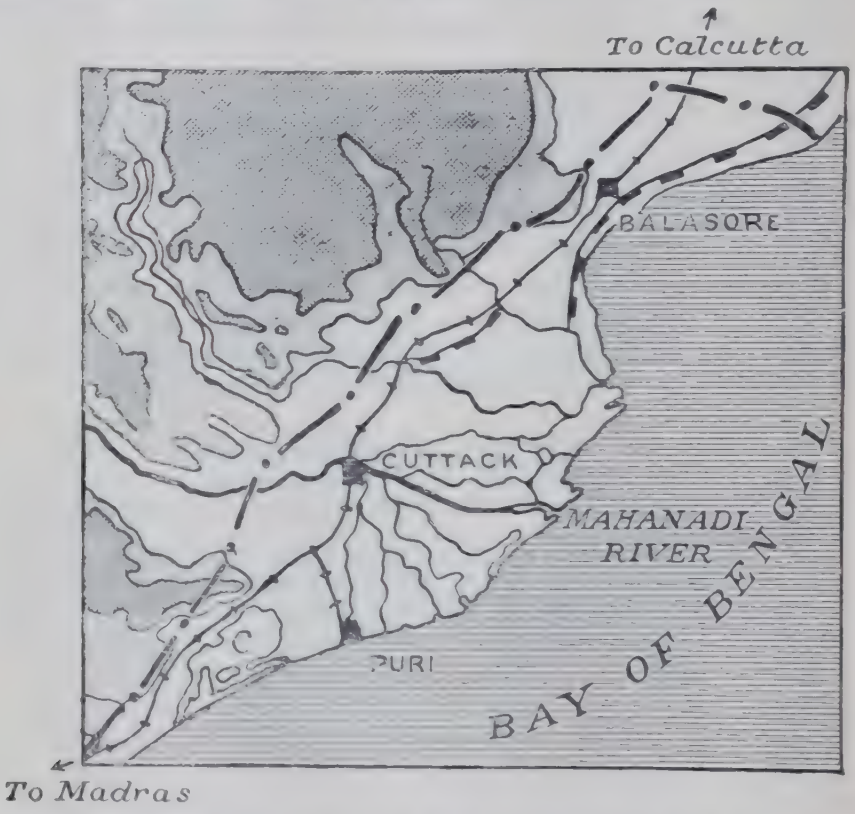

FIG. 54.—The Orissa Coastal Strip. Land over 500 feet with light dots, land over 1,000 feet with heavy dots.

land which we find right down the east-coast of India. If you look at Fig. 8 in Chapter II, or better still, the map in

[1] Comprising Orissa proper, namely the Districts of Balasore, Cuttack and Puri.

your atlas in which the low lands of India are coloured green and the high lands brown, you will see that there is a strip of low land running down the east coast between the plateau land and the sea. The part which we are going to study forms part of the Province of Bihar and Orissa, that part known as Orissa.

The Orissa Coastal Strip is only from 15 to 80 miles wide and you will see that a large part of it forms the delta of the Mahanadi. In the south there is a large shallow lake, really a piece of the sea which has been cut off, called Chilka Lake. In many ways this Natural Region is like the Delta but very much smaller.

2. The region can be divided into three parts. Along the sea-board is a low-lying swampy area intersected by narrow winding creeks and covered by mangroves just like the Sundarbans. The soil is full of salt and the manufacture of salt used to be an important industry. Sometimes between the mangrove swamps and the sea we find a belt of sandy ridges formed of sand blown along the sea-shore. The town of Puri is built on one of these sandy ridges and is a pleasant place which people from Calcutta visit for their holidays.

Behind the mangrove swamps are fertile stretches of alluvium covered with paddy fields, constituting the second part.

The third part of the Natural Region consists of lands rising gently from the alluvial plain to the hills behind. There are low ranges of hills, covered with trees, and also fertile valleys.

3. See what you have learnt about the climate of this part of India. The monsoon winds blow parallel to the coast and so only deposit a moderate rainfall. It is about 50 inches over the whole Natural Region, but the air is damp and steamy. Like most regions on the sea-coast the range of temperature is only small.

Look at Fig. 55 and notice the proportion of waste land and cultivated land. There is much waste land as in the Deltas Region because the soil where it is full of salt cannot grow food crops, and the mangrove swamps cover large areas.

If we look at the productions we find that rice is by far the most important and occupies 4 5 of the whole area

occupied by crops. Fig. 56 shows you the areas occupied by other crops.

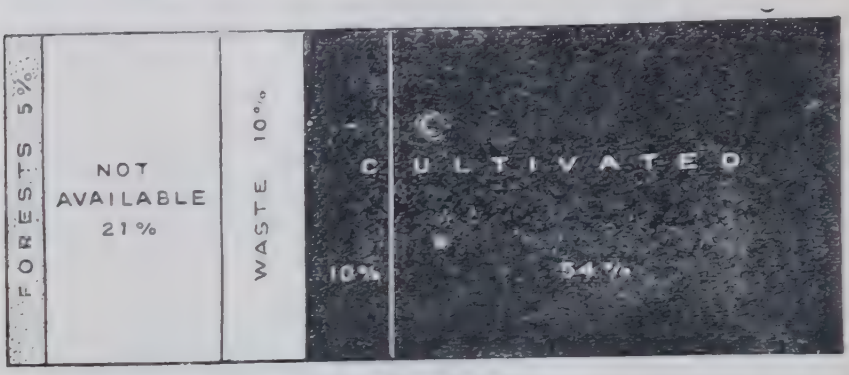

Fig 55—Proportion of cultivated land in the Orissa Coastal Strip.

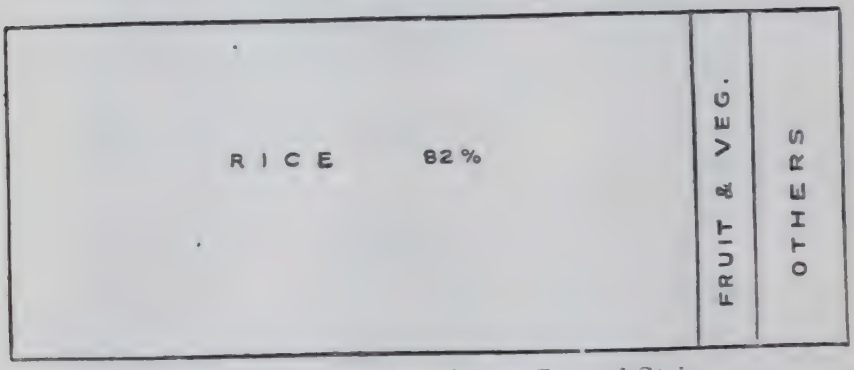

Fig. 56.—Crops of the Orissa Coastal Strip.

4. The chief towns are Puri, a famous place of pilgrimage; Cuttack the old capital of the kings of Orissa and Balasore formerly an important port with English, Dutch and French factories, but now little used. The broad gauge railway line from Calcutta to Madras passes right through the region. Although this Natural Region is only small, the small area of rich paddy land has attracted many people and there are now nearly 500 people in every square mile.

QUESTIONS AND EXERCISES

1. Find another Natural Region in the world like this one.
2. Compare a day in the life of a villager living in this Natural Region with a day in the life of a villager living in the Eastern Hills.
3. Compare this Natural Region with the Brahmaputra Valley.

CHAPTER XV

THE CHOTA NAGPUR PLATEAU [1]

1. In Chapter III, paragraph 6, is a description of the way in which mountains are formed. But it has happened in many parts of the world that not only has the surface of the earth been raised in lines of mountains, but great blocks of the surface have been raised up bodily. Broad elevated portions of the earth's surface such as these are called 'plateaux'. (The 'x', which is not pronounced, marks the plural. The singular is 'a plateau').

Open your atlas and find Tibet. Tibet is a high plateau, so high, that in your atlas it is marked in a special colour. It is over three miles high. Another plateau is Greenland and there are many others—the widest portion of the Rocky Mountains in America, Southern Africa and Arabia. Find all these places in your atlas.

In India, that part named 'Peninsular India' or sometimes the 'Deccan' is a plateau. The Natural Region which we are now going to study and which we have called the Chota Nagpur Plateau is really only part of the much large plateau of Peninsular India. It is the north-eastern corner of it.

The Chota Nagpur Plateau is bounded by the Ganges Valley on the north and stretches southwards nearly as far as the sea. It is only separated from the sea by the narrow Coastal Strip of Orissa. Generally, it is between 2,000 and 2,500 feet high but if you look at Fig. 57 you will be able to see parts which rise to more than 3,000 feet and also parts which are below 1,000 feet. The lower places are the river valleys, cut out of the plateau, the higher places are the hills standing on its surface. You will notice in the southern part that the River Mahanadi

[1] Comprises the whole of the Native States of Orissa, the sub-province of Chota Nagpur and part of Southern Bihar (part of districts of Shahabad, Patna, Gaya and Monghyr) and the greater part of Mirzapur (United Provinces) as well as the coalfields of Western Bengal.

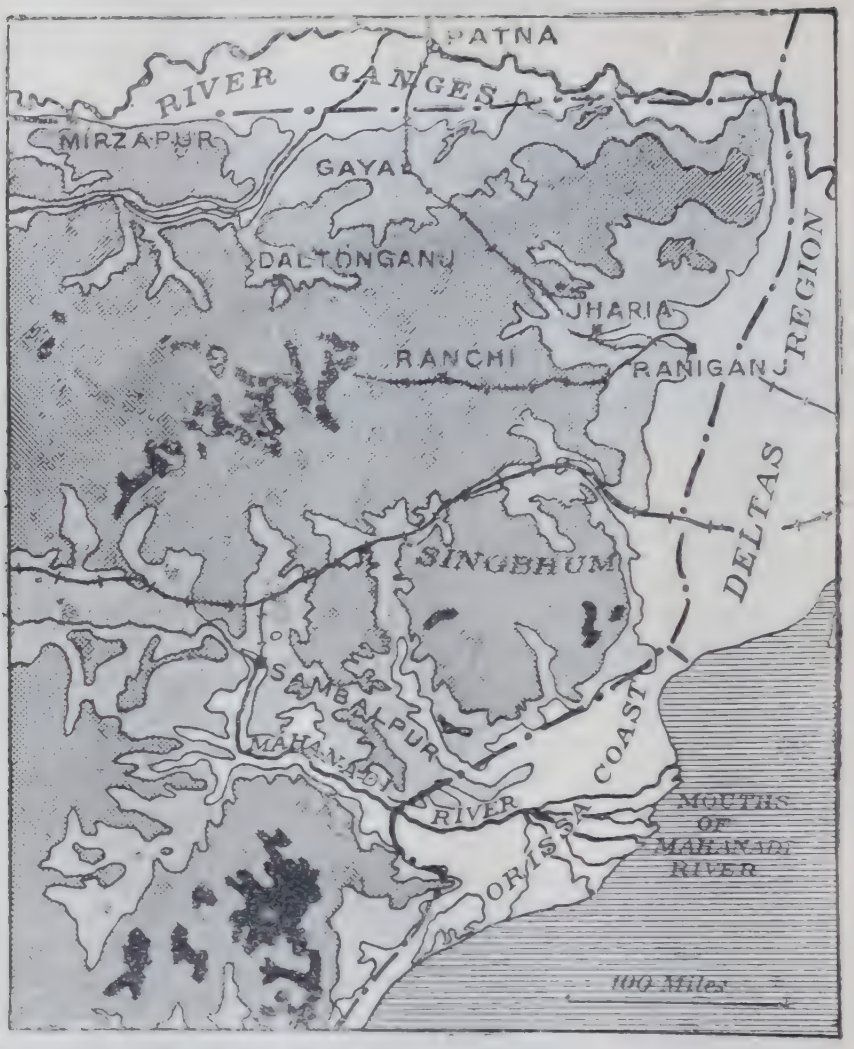

FIG. 57.—The Chota Nagpur Plateau. Land 500–1,000 feet, few dots; land 1,000–3,000, many dots; land over 3,000 feet, black.

and its tributaries have cut broad deep valleys and worn away a great part of the plateau. You will see that the plateau has been more worn away by rivers in the south than it has in the north.

If you were to go to the Chota Nagpur Plateau and walk through the country in various directions you would find

that in some places you had to climb hills thickly covered with forest, and cross narrow valleys, while in other places the land would be almost flat, the surface being a broad plain gently rising and falling. What has caused these differences? The anwer to that is 'Rain and Rivers'. You learned in Chapter III how rain and rivers can alter the surface of the land.

2. The forests are the most important part of the Chota Nagpur Plateau. The rainfall is good—look at Fig. 24

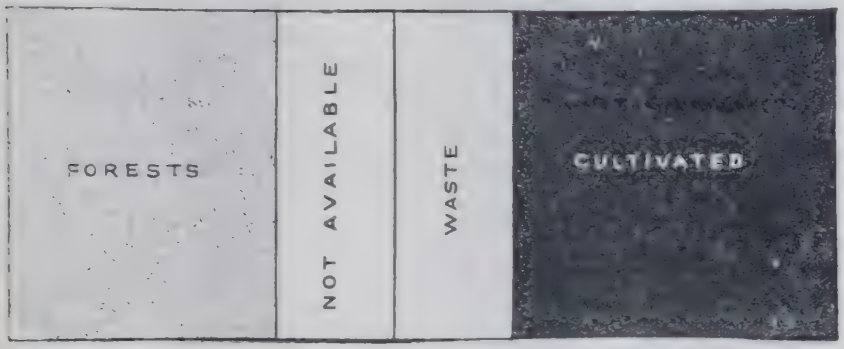

FIG. 58.—Proportion of cultivated land in the Chota Nagpur Plateau, not including the northern slopes with sandy soil in Gaya and Mirzapur, where are found few forests, but much waste land.

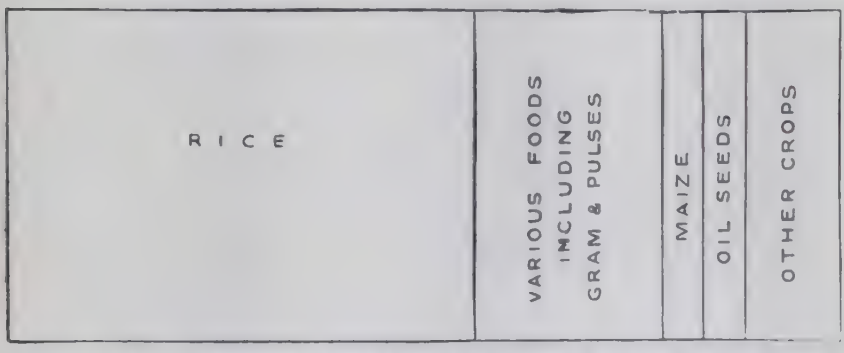

FIG. 59.—The crops of the Chota Nagpur Plateau, excluding the sandy soils of the northern slopes in Gaya and Mirzapur where about one-third of the rice area is replaced by wheat and barley.

and you will see that everywhere it receives more than 40 inches of rain and so we find splendid forests of the valuable sal tree and other trees whose wood forms good timber. On the flatter parts of the plateau we may find open grassy

downland or areas of scrubland. Many of the river valleys are rocky but where they are broader paddy can be grown. The paddy fields are not like the big flat ones which most of you see near your homes, but they are narrow ones built down the valley sides like a series of big steps. The soil in the valleys is often good because the rain washes down the fine particles from the hill sides into the valley, but on the ridges the soil is often poor. On the hill sides or ridges where the soil is good enough, maize, millets, oilseeds and pulses can be grown. Look at Fig. 58 and you will see what a small proportion of the land is cultivated. Much of it is 'waste' and a large part is covered with forests. In the north of the region, on the slopes towards the Ganges Valley, there are large areas of dry sandy soil as in Mirzapur. An important industry in the forested parts is the collection of lac. Lac is a sticky or resinous substance deposited on the small branches of trees by a tiny insect called the lac insect. It is collected and purified and is used for many purposes, such as the manufacture of paint and varnish, sealing-wax and gramophone records.

Not many people live in this Natural Region. It is, as we say, thinly populated—only about 180 persons per square mile. Most of the people live near the big river valleys where they can cultivate rice, or on the slopes of the plateau near the Ganges Valley or the Coalfields. The central parts covered by forest are amongst the wildest and least known parts of India and are inhabited by very primitive tribes. Many of these forest tribes still use bows and arrows, and some of them live mainly on the wild animals, chiefly monkeys, they catch or on wild fruits gathered from the trees. The only clothing some of them wear consists of a few leaves.

The Chota Nagpur Plateau gives us a fine example of how the people living in one natural region may be quite cut off from those living in another. This is often so with people living in hilly regions or forests where it is difficult to travel about. In the plains the people can travel about easily and so exchange ideas with one another and thus become civilized. But in the hills it is difficult to travel about and the people keep all their old customs. You learn in your history how successive races have invaded India and settled in the fertile plains and have driven the

original inhabitants away into the hills. The natives of the Chota Nagpur Plateau were in past ages driven into the hills and there they have remained. They are small people only about five feet high, honest, and brave. They would look upon us who live in the plains as 'foreigners'. There are many different tribes, the Santals are the most numerous. Many of the tribes speak old languages of their own, quite different from any of ours. It is found that out of every 100 people only three travel on a railway in a year, so you see they are still very backward.

3. You have learnt in Chapter III that most of the valuable minerals are found in areas of old, hard crystalline rocks, like those which form the Chota Nagpur Plateau. In the north are many mica mines. Mica is a mineral rather like glass, you can see through, but it can be bent and it can also be made very very hot without melting. So it is used for making little windows in furnaces where glass would be melted, and for other purposes. In the district of Singhbhum are found valuable deposits of iron ore as well as copper and manganese. Limestone is also quarried in several places. In the beds of the Mahanadi and other rivers a little gold is found and also diamonds. Other minerals may become important when the country is more developed. By far the most important mineral industry is the

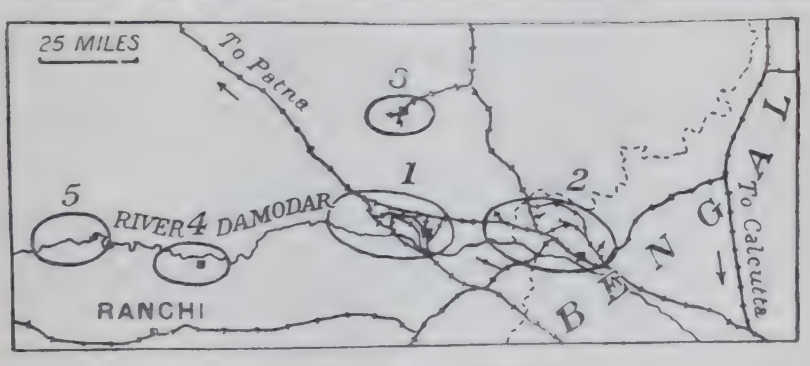

FIG. 60.—The Coalfields.

1 = Jherria Field. 2 = Raniganj Field. 3 = Giridih Field. 4 = Bokaro-Ramgarh Field. 5 = Karanpura Fields.

Notice the network of railways in the two most important fields (1 and 2).

mining of coal, there is a small coalfield around Daltonganj, but the important ones are on the borders of Bihar and

Orissa and Bengal. The chief centres of coalfields are Jherria, Raniganj and Asansol, and these fields produce the best, and 9/10 of the total coal of India. About 17,000,000 (seventeen million) tons of coal are produced every year and about 150,000 people employed in mining. The miners are mainly local people who turn to mining when crops fail. The coal is used on the railways of India and much is sent to the jute factories of the Delta Regions. Only a little is exported.

4. There is only one railway across this Natural Region. Notice that it follows a succession of valleys. It is the main line of the Bengal-Nagpur Railway from Calcutta to Nagpur and Bombay. A branch from this railway runs to Sambalpur on the Mahanadi River. The most important town on the Chota Nagpur Plateau is Ranchi, reached by a branch railway from the busy coalfields district. It is more than 2,000 feet above sea-level and so is much cooler than places on the plains and is the 'hotweather Capital' of Bihar and Orissa. On the northern slopes of the Plateau is Gaya, a great place of pilgrimage for Hindus. Near it is Bodh Gaya, the most sacred place in the world to many Buddhists for it was here that the Lord Buddha, the Founder of the Buddhist religion, received his great wisdom.

QUESTIONS AND EXERCISES

1. Why does the Chota Nagpur Plateau form a Natural Region?
2. Do you think this Natural Region will ever become an important part of India? Give your reasons fully.
3. Draw a sketch-map to show valley routes in the Chota Nagpur Plateau. What use is made of them?
4. Describe the agriculture of the Chota Nagpur Plateau
5. Describe the life of the people in a coal-mining district.

CHAPTER XVI

THE CENTRAL INDIAN PLATEAU

1. Only a small part of this great natural region falls within the area we are studying. That part of the United Provinces which is south of the Jumna River forms the northern slopes of the plateau. Usually a short distance south of the river there is a small but sharp rise and going southwards we find ourselves in quite different country from the fertile plains of the Ganges Valley with their numerous irrigation canals, their flat fields of wheat and barley or their fields of irrigated rice.

The country looks bare and dry ; everywhere the rainfall is less than 40 inches and it is too dry for the proper growth of forests. Instead we see large waste areas covered with thorny scrubland or thorny trees ; we notice that the villages are farther apart and there are fewer people. If we look at the crops growing in the fields as we pass, we notice gram and millet everywhere—they are the most important crops and millet forms the principal food of the people. We also see fields of wheat, but only in some of the lower areas do we find carefully levelled fields with rice. Another important ' dry zone ' crop is sesamum and we find that cotton too is important. Look carefully at Fig. 62 and notice the very small proportion of useful forest and the large area of waste land. Now study Fig. 63 and notice the crops which are grown. Compare this diagram with Figs. 49, 59, etc., and notice that the crops in the dry Central Indian Plateau are quite different from those in all the other natural regions you have studied in this book.

2. Look at Fig. 24, the rainfall map. If you compare the Upper Ganges Valley and the Central Indian Plateau what do you notice ? They both have the same amount of rain yet the Plateau region has fewer people, produces fewer crops. Why is this ? It is because the Upper

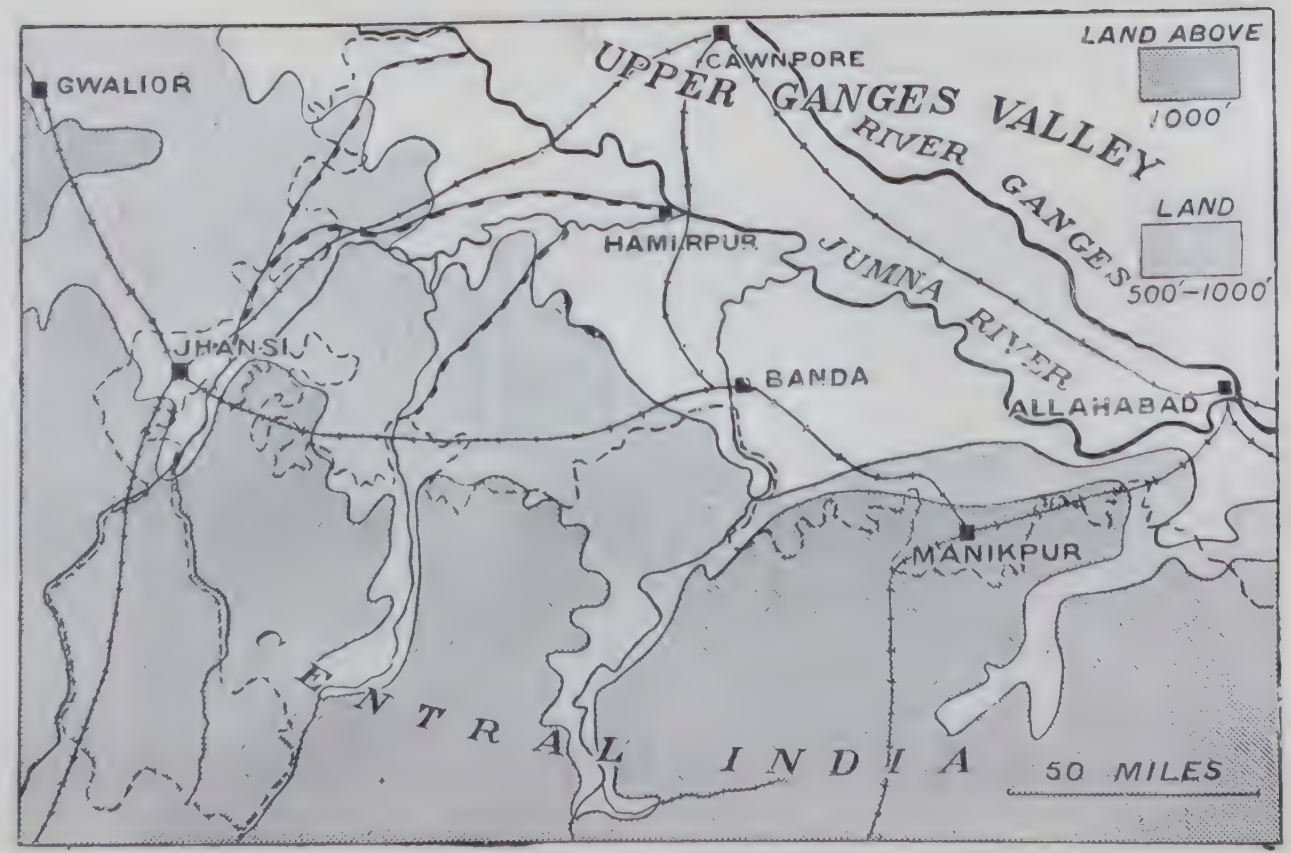

FIG. 61.—The Central Indian Plateau.

Ganges Valley is a broad flat plain and can easily be irrigated but the Plateau is a hilly region and cannot easily be irrigated. Many of the rivers flowing down from the

FIG. 62.—Proportion of cultivated land in the Central Indian Plateau (portion included in the United Provinces). (1) 'Fallow'; (2) 'sown.'

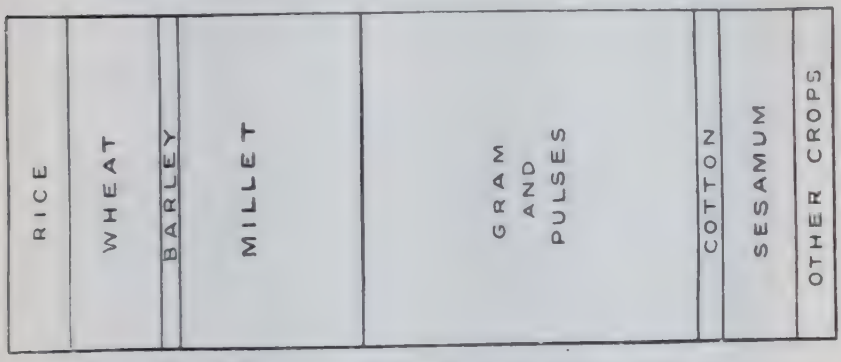

FIG. 63.—The crops of the Central Indian Plateau.

Plateau towards the River Jumna dry up in November or December. This is just at the time that water is most needed for the crops and so 'wiers' or 'dams' have been built across several of the rivers behind which the water collects during the rainy season and in the early part of the dry season is carried by means of canals to irrigate the fields. Later in the season rivers and canals all dry up, and so are much less important than the great canal systems of the Upper Ganges Valley about which you learn in Chapter XVII. You learnt in Chapter VI that the influence of the sea keeps a country cool. The Central Indian Plateau is far from

the sea, and has a low rainfall. We find that it is cold in the cold season, but suffers from great heat in the hot season. Look at Figs. 14 and 15 and notice the range of temperature.

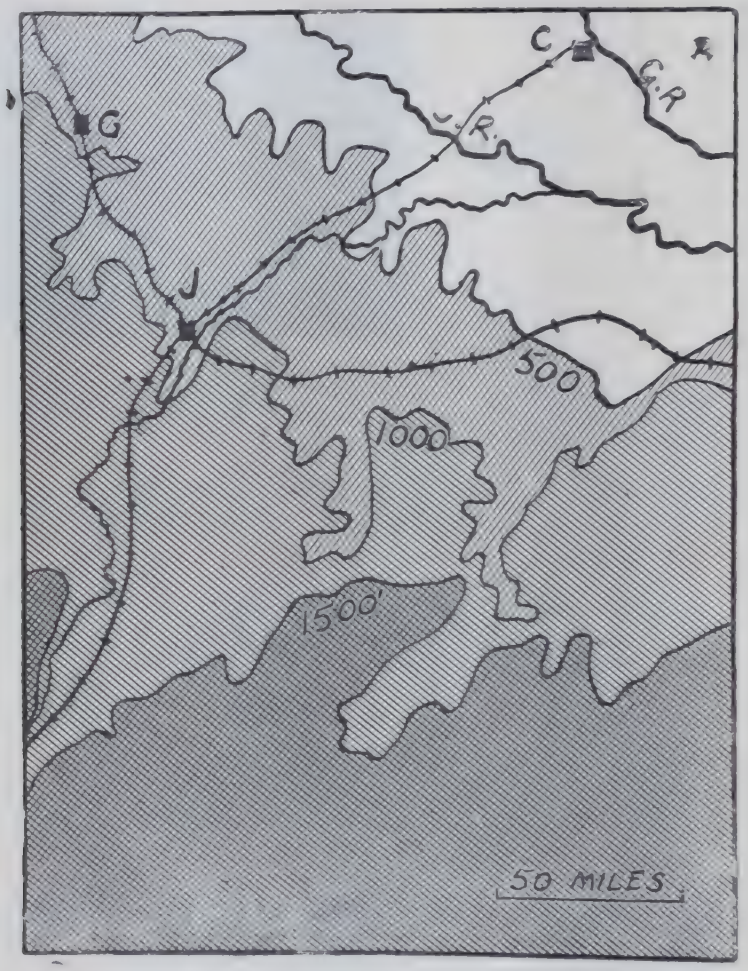

FIG. 64.—The Position of Jhansi (J). Notice its position on the easy valley route from the Ganges Plains (C = Cawnpore) to the Central Indian Plateau.

G. = Gwalior ; G.R. = Ganges ; J.R. = Jumna River.

We must notice too a great difference in soils. You have learnt about the alluvium of the plains and how it is formed. In the Central Indian Plateau we find large areas of a dark-coloured clay. It is called the 'Black Cotton Soil' because

it is dark in colour, but is a good soil for cotton. In Chapter III you learnt what is a volcano and that the molten rock poured out by a volcano is called lava. Long ages ago great sheets of lava were poured out over the Central Indian Plateau. Rain and weather have acted on the lava and helped to change the top layers into soil. The soil we find formed from the lava is the Black Cotton Soil, and stretches over part of the area we are studying. Find it on Fig. 11.

3. In the Central Indian Plateau there are less than 200 persons living in each square mile. Compare this with the regions of the plains. In the part of the plateau we are studying most of the people are farmers or agriculturalists and live in villages. There are few large towns. About twenty years ago there were scarcely any railways in the region, but now one has been built from west to east (Jhansi through Banda to Manikpur, with a short line connecting Banda and Hamirpur with Cawnpore in the plains). These cities are 'Collecting stations' for local product. Jhansi is the most important; notice how it is situated in a valley along which the main railway from the plains (Cawnpore) can penetrate into the Central Indian Plateau.

QUESTIONS AND EXERCISES

1. How is the Central Indian Plateau different from the Chota Nagpur Plateau?
2. What are the two dry regions you study in this book? How do they differ? Why have they different crops?
3. Draw a section from the northern part of Nepal to the Central Indian Plateau.
4. Find another natural region in the world like this one.

CHAPTER XVII

THE UPPER GANGES VALLEY

1. The natural region of Northern India we are now going to study is part of the vast plain of Hindustan. For a thousand miles from end to end there is not a hill in this plain, neither is there for hundreds of miles from north to south. Many of you who live in this great region have perhaps never seen a hill; other boys and girls who live where hills are everywhere cannot imagine what it is like to live in a flat plain and never to see a hill. This great plain is like the sea; to travel over it reminds you of being at sea. On all sides it stretches away absolutely flat and fades away in the distance. Perhaps in the early morning or in the evening the great heights of the Himalayas away to the north can be seen. Through the plain flow thousands of rivers, large and small, which rise in the great mountains to the north and are fed by the melting snows. All of them sooner or later join the broad stream of the River Ganges. The Ganges is not only the greatest river of India, but one of the great rivers of the world. It is not so long as many others in the world, it is not even so long as the Brahmaputra, but its valley is one of the most fertile and thickly populated in any country. Dotted over the great plain are the villages of the cultivators, each with its clump of bamboos or a few trees. Here and there are large and busy towns. Everywhere else stretch fields of golden wheat or barley, or green fields of paddy and other crops.

2. The Upper Ganges Valley is the Dry Region. You must remember that it is not divided off from the rest of the plain by a sharp line. The climate gradually becomes more and more dry, as you travel up the valley from Calcutta through Malda, Patna, Benares to Allahabad. There is no place at which you can say 'Here the Dry Region begins.' But we may say roughly that all parts of the Ganges Valley which have a rainfall of less than 40 inches belong to the Dry Region or Upper Ganges Valley.

Look at Fig. 24 and you will notice that the 40 inches rainfall line runs nearly through the town of Allahabad. As we go westward from Allahabad, the climate steadily gets drier till we reach Delhi. The country beyond Delhi is still drier, but we make it a separate Natural Region because it is part of the Indus Valley. The Dry Region, or Upper Ganges Valley stretches then from Delhi to Allahabad.

FIG. 65.—The Upper Ganges Valley. All land over 1,000 feet black. Look in your atlas and notice the very many railways in this part of India and also where they run.

3. Looking at Fig. 65 we see that about the centre of the Region the River Ganges flows in a south-easterly

direction. It enters the region from the Himalaya Mountains near Hardwar and leaves it in the south-east at Allahabad. Forming roughly the western and later the southern boundary of the Region is the River Jumna, on which Delhi stands. It too rises in the Himalaya Mountains and flows for a long distance southwards but gradually turns south-eastwards—where it divides the Ganges Plain from the slopes of the Central Indian Plateau (Chapter XVI), finally joining the River Ganges at Allahabad. A great part of the Upper Ganges Valley is formed, then, by the Ganges-Jumna Doab (or country between those two rivers). North-east of the River Ganges there is broad strip of country where the rainfall is less than 40 inches in a year, and then another strip where it is slightly more than 40 inches, before we reach the Sub-Himalayan Region. Although in this northern part the rainfall is slightly greater than in the Doab, the crops grown are like those in other parts of the Dry Region and so we may say the Dry Region stretches over the whole Ganges Plain from the Sub-Himalayan Region (as far east as the Gogra River) on the north to the River Jumna on the south. Over the whole of this country there is no hill at all, it is one great plain sloping very gently from Delhi (700 feet) or Saharanpur (about 800 feet above sea-level) to Allahabad (400 feet).

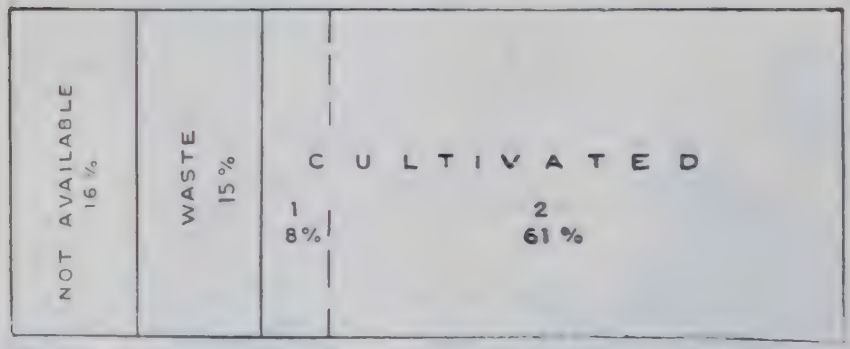

FIG. 66.—Proportion of cultivated land in the Upper Ganges Valley.

4. In Chapters IV and VI, we have learned that this Dry Region is particularly hot in the months of May, June and July because it receives no cooling sea-breeze, and the sun shines brilliantly on its level plains. We learned also

that in the months of December and January the Dry Region is cooler, generally speaking, than other parts of North-eastern India, because level plains which are far away from the sea cool very quickly.

When we were studying the rainfall map in Chapter V, we saw that most of this region gets less than 40 inches of rain in the whole year. Now it is difficult for us who are living in India and who have never visited other countries in the world, to realize that India is really a wet country. It will help us if we remember that in England, where most rain falls on the mountains in the west, the very wettest parts of the country get only just over 80 inches of rain in the year, while most of England gets only 30 inches, that is about the same amount as Cawnpore or a little more than Delhi gets. Yet there is no Dry Region in England, because the rain

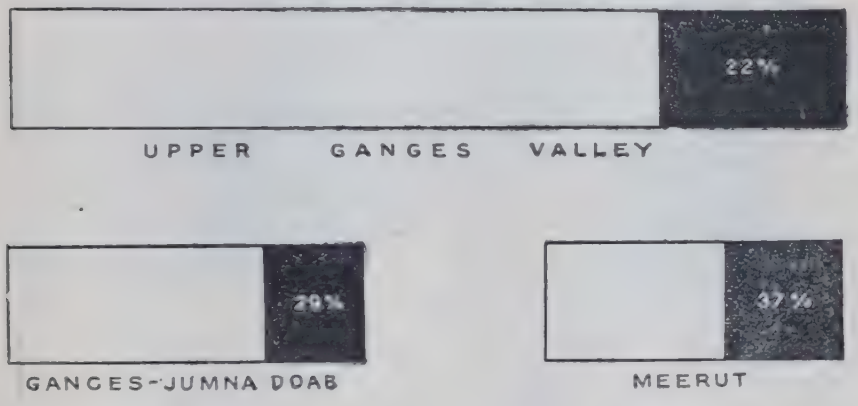

FIG. 67.—Proportion of irrigated area in the Dry Region or Upper Ganges Valley. Irrigated portion in black.

falls gently and at all times of the year; on North-eastern India nearly all the rain falls at one time, in July, August and September. Again, generally speaking, the whole of Europe gets only 50 inches of rain in a year. Remember that Calcutta gets 70, Dacca gets 100 and Patna nearly 50 inches. Yet Europe still has many very rich agricultural countries, because its 50 inches of rain are spread out over most of the year. If the rain in the Dry Region we are studying now fell a little at a time during each month, and not all at once in the wet season, the crops would be very

different, but we must remember, too, that the sun is more powerful in India than in Europe and dries up the soil more quickly. Thus we see that the dry part of the Upper Ganges Valley suffers, not because it gets so little rain but because all the rain comes at one time, during a few months only. We will now learn how man has overcome the dryness of the climate and has made this region one of the most productive in the world.

5. From earliest times the kings, rulers and people of the dry Upper Ganges Valley have built and used wells, tanks and canals in order to provide themselves with water. Since India became part of the British Empire, the Government has spent large sums of money in improving these old canals and building new ones. The chief canals are shown

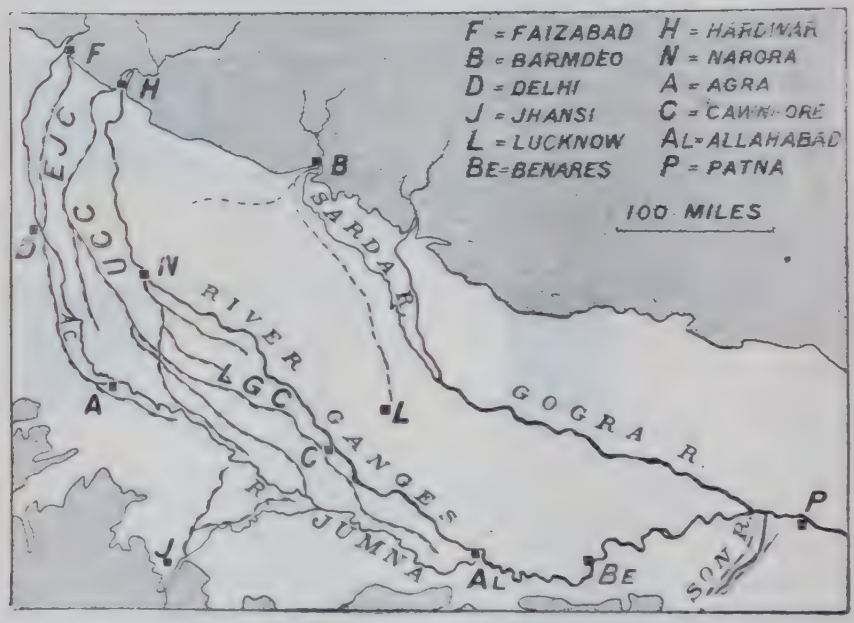

FIG. 68.—The Irrigation Canals of the Upper Ganges Valley. Land over 1,000 feet dotted.

in Fig. 68. In the United Provinces over 11 million acres are irrigated or $\frac{1}{6}$ of the whole area. When we remember that a great part of the United Provinces falls in the Central Plateau and Himalayan Regions or the wetter regions of the Central Ganges Valley we see what a large

area of the dry part must be irrigated. Let us look at the Ganges-Jumna Doab. It has an area of nearly 12 million acres, but out of this a considerable proportion (42 per cent) is waste land or land which cannot be used. But out of about 7 million acres sown with crops, not less than 3½ million acres are irrigated and of this great irrigated area more than 2,000,000 acres are watered by Government canals. If we take Meerut as an example of a district which is highly irrigated, we find far more than half the crops

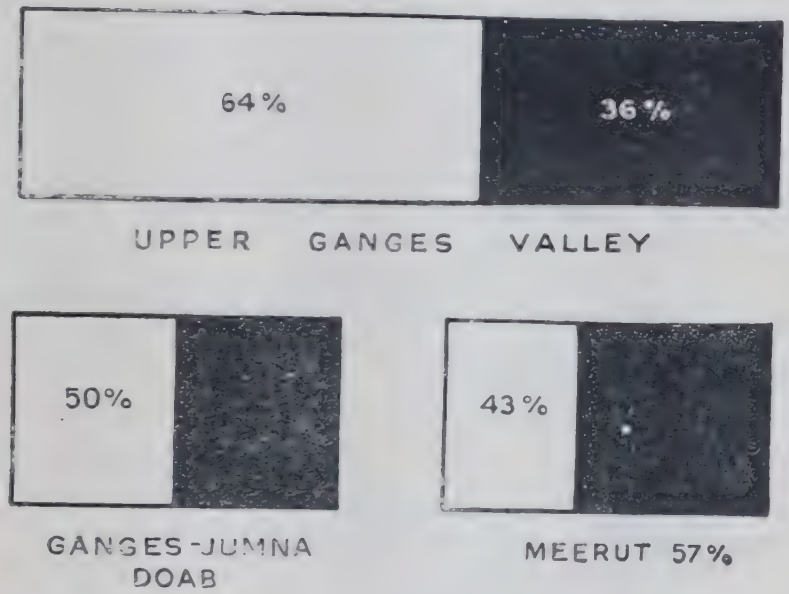

FIG. 69.—Proportion of irrigated crops in the Dry Region or Upper Ganges Valley. Irrigated portion in black.

(57 per cent) are grown on irrigated land. You will realize these figures more clearly if you study Figs. 67 and 69.

Since Irrigation Canals are so very important, let us study how they are arranged. Although the rainfall in the Upper Ganges Plain is poor, there is a good rainfall, as well as a heavy snowfall on the Himalaya Mountains to the north. As a result the rivers which rise in those mountains are never dry but are always bringing water down from the mountains to the plains. In some seasons of the year there is more water than at others. It sometimes happens that most water is required for irrigation when the river is

at its lowest. The first stages in building a great irrigation canal are

(1) to choose a suitable spot on the river where its supply of water can be 'tapped'.

(2) to build across the river a wall (called a dam or wier) so that the water will collect behind and form a lake which will never be dry. In the rainy season more water will flow into this lake than is required and it is allowed to escape over the wall. But in the dry season nearly all the water in the lake will be used for the canal.

The dam or wier from which the canal starts is called the 'head' of the canal. The main canal is then cut right across the country. The slope of the canal is very, very gentle so that the water only moves slowly and not rapidly as it does in many rivers. Often the surface of the land slopes more rapidly than is desirable for the canal and so the canal has to be built upon an embankment. From the main canal big branch canals are constructed. (See Fig. 68). The water is actually distributed to the land through a series of small side branches called distributary canals. The amount of water passing into these small canals has to be very carefully regulated.

In the Upper Ganges Valley there are four very large and important canal systems :—

(1) The Eastern Jumna Canal which takes the water from the Jumna River near Faizabad, just where the River Jumna comes down from the Himalaya Mountains.

(2) The Agra Canal which takes the water from the Jumna River just below Delhi.

(3) The Upper Ganges Canal which takes the water from the Ganges River near Hardwar, just where the River Ganges comes down from the Himalayas.

(4) The Lower Ganges Canal which takes the water from the River Ganges at Narora.

Notice the Eastern Jumna and the two Ganges Canals irrigate the Ganges-Jumna Doab, but the Agra Canal waters the land south of the Jumna.

North of the River Ganges the irrigation is almost entirely from wells and tanks, but a very big wier is now being built across the Sarda River near Barmdeo. This canal will irrigate the country to the south-east as far as Lucknow.

Read the Chapter on the Central Indian Plateau and see what is said about the smaller canals there.

6. You can understand now that if the canals were destroyed, those parts of the Upper Ganges Valley which rely on them for water would be of very little use at all. But the canals cost a very large amount of money to build and keep in repair. Government has spent about 15 crores of rupees in the Upper Ganges Plain alone. If the canals were destroyed, thousands would perish of famine and one of the most fertile and thickly populated regions of the world would become practically a desert.

There is another important result of irrigation. It allows much of the land to be 'double-cropped', that is two crops are grown on the same piece of ground in one year. Wheat is usually a 'winter crop'; other crops can be grown on the same land in the hot season and the rains.

Now let us learn something about the crops grown in this Natural Region. Read Chapter VII again carefully. You will find very important facts about the crops and vegetation of the Dry Regions of the Ganges Valley. Now

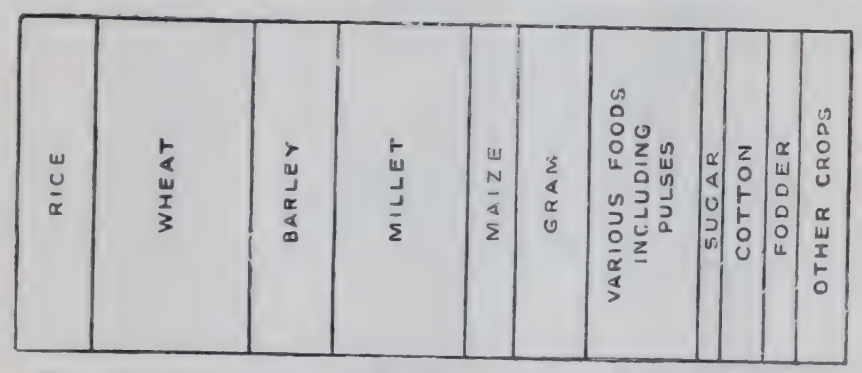

FIG. 70.—The crops of the Upper Ganges Valley or Dry Region.

look at Fig. 70—the crops of the Upper Ganges Valley. Everywhere in this region wheat and barley occupy a larger area than rice. Nearly always, except just on the eastern borders, wheat alone is more important than rice. Some of the driest districts grow no rice at all. We must remember that the wheat is the principal food of many of the industrial peoples of Europe and before the Great War was an important export from this region, but now the people use

nearly all themselves. Another important food of the people themselves who live in the Dry Region of the Upper Ganges Valley is millet, which forms a very important crop, second in importance only to wheat. Other food crops include maize, gram and various pulses. By far the most important crop not grown for food is cotton. The United States of America produce more than half the world's supply of cotton, but India comes second in importance in the world's supply. Nearly all the drier parts of India grow cotton and the drier parts of the area we are now studying are one region—especially round Agra and Delhi. You learnt in Chapter VII what is meant by 'short-stapled cotton.' The native Indian cottons are short-stapled and can be grown on land which is not irrigated. The much better long-stapled American varieties can be grown in India on irrigated land and form an important part of the crop. Sugar-cane is grown in most parts of India, but the most important region is the one we are now studying. You will notice from Fig. 70 that sugar only occupies a small area when compared with other crops, but it is still very important.

In dry regions like the Upper Ganges Valley, there is often not enough grass to feed cattle and so food (called 'fodder') has to be grown for them. Fodder is an important crop because, for its size, the Upper Ganges Valley has more cattle than any other region of India. Both bullocks and buffaloes are very numerous. They are used for ploughing, but a large number of cows are kept for the sake of their milk. There are not many sheep in this region—sheep thrive in dry regions and can live on much poorer grass than cattle. Although this region is a dry one it is so extensively cultivated that there is little waste land left on which sheep can be kept.

7. You will now have to learn that the larger number of the people in this natural region are engaged in agriculture. They live in small villages, scattered over the plains. Their huts are built of mud or mud and wattle, for there is no stone in the great alluvial plain. In some parts of the world we find agriculture is carried on from isolated houses or 'farms', each house being some distance from the next. This is the case in America and Europe and also in the Deltas Region. But in days gone by the peaceful cultivators of India suffered much from robbers who swept

down upon them from the hilly regions and so they lived together in villages for protection. In this region they have never changed their habits and still live together in small villages. Throughout this Natural Region, the people speak Hindustani, and by far the larger number are Hindus. Out of every 1,000 people in this Natural Region only about 120 live in towns of more than 5,000 people. In the Upper

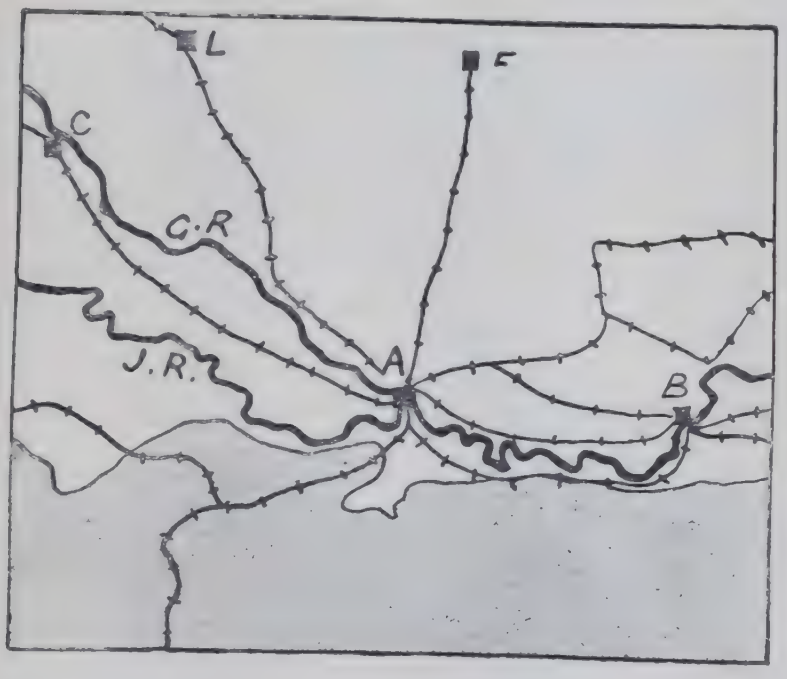

Fig. 71.—The position of Allahabad.

(1) at the junction of the Ganges River (G.R.) and the Jumna River (J.R.)

(2) as a great railway centre.

(3) near the southern border of the Ganges Plain, between the Upper Dry Regions and the Middle Valley and near the Central Indian Plateau.

Ganges Valley there are only 14 cities with more than 50,000 people, and many of these are becoming smaller rather than larger. The largest and most important city is, of course, Delhi, the capital of India, which we must study separately. We can divide the other cities into two groups.

(1) The Great Cities of the Past; famous religious

centres or ancient capitals such as Lucknow, Allahabad and Muttra.

(2) Cities which have adapted themselves to modern needs and form collecting stations for agricultural produce or have developed manufactures of their own, such as Cawnpore, Meerut and Moradabad. Included here are the 'frontier' towns on the borders of the Sub-Himalayan Region. Saharanpur is the most important.

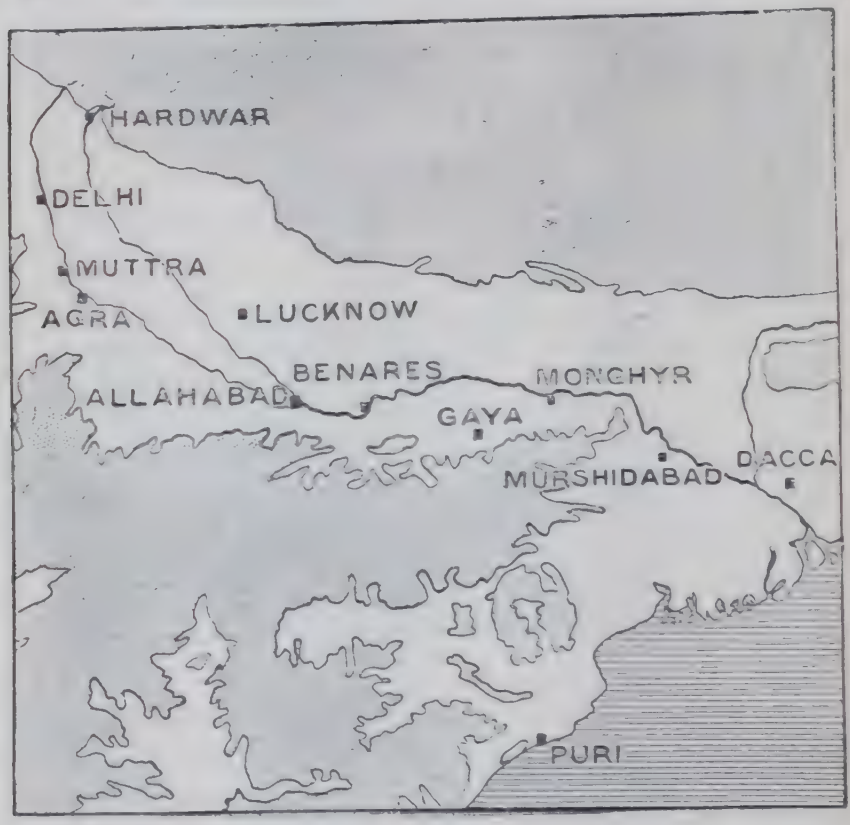

Fig. 72.—The historic towns of the Ganges Valley. All land over 1,000 feet dotted.

Lucknow is still the largest city of the province and an old capital. It is an important railway centre and has small manufactures, but is rapidly getting smaller.

Allahabad, situated at the junction of the Jumna and the sacred Ganges, is a very important place of pilgrimage. Its

position at the junction of these two great waterways and now as a railway centre makes it an important collecting centre, but it has no manufactures of its own. It is the centre of Government of the United Provinces and a considerable proportion of its people are in Government employ.

Muttra on the Jumna near the head of the Agra Canal is an important religious centre.

Farrukhabad on the Ganges is an example of a place which used to be important owing to its situation on the great waterway, but the railways have now become the great arteries of trade and Farrukhabad is rapidly decreasing.

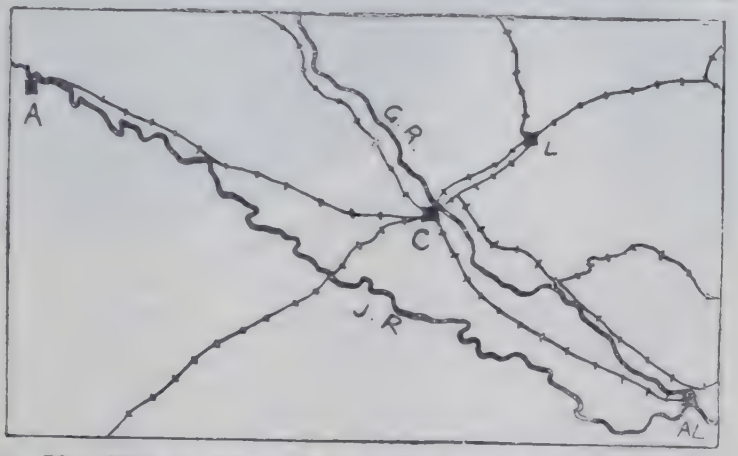

Fig. 73.—The position of Cawnpore, as a railway centre in the midst of the rich Jumna-Ganges Doab.

A. = Agra ; L. = Lucknow ; J.R. = Jumna River ; G.R = Ganges River.

Cawnpore on the Ganges is the one of the largest cities in the region. It is a great railway centre, it is the chief collecting station for the agricultural products of the whole region and has important manufactures of its own.

Meerut and Moradabad are growing centres in the richest parts of the region. *Agra* has also important industries.

Other big towns you should notice are Bareilly, Aligarh, Rampur and Shajahanpur.

8. *Delhi*, the capital of India, is a large city of more than 300,000 inhabitants—the sixth largest city in India. It owes its importance to what we call the 'strategic' character of its position. Look at Fig. 74 and notice that

Delhi stands at the head of both the great plains—the great fertile plain of the Ganges and the great plain of the Indus. From Delhi any place in these great plains is easily reached. In days gone by, as you learn from your history, India was invaded many times from the north-west. The invaders had to pass through or near Delhi on the way: they could not go to the north because they were shut in by the Himalaya Mountains, they could not go to the

Fig. 74.—The position of Delhi.

T. = The Thar Desert. Land over 1,000 feet dotted; land over 3,000 feet black.

south for there is the great barren waste of the great Indian Desert; or the hilly dry lands of the Central Indian Plateau. So in the past Delhi has often been the capital of India. From it the rulers could easily reach and control all parts, but especially the fertile valley regions. Now also Delhi is the capital of India. Owing to irrigation the lands round about are fertile and covered with crops. Much cotton is grown and finds its way to Delhi where cotton manufacture is carried on. Standing on the Jumna, Delhi is at the 'head of navigation' of that great river and

boats can go all the way from Delhi to Calcutta. The land routes from the north-west there joined the water routes of the north-east. In modern times railways have largely replaced the land and river routes and Delhi has become a great railway centre; easily reached from all parts of India. At a convenient distance to the north, on the healthy heights of the Himalayas is Simla, the hot-weather seat of Government. During the hot weather the Government moves from Delhi to Simla.

QUESTIONS AND EXERCISES

1. Describe the climate of the Upper Ganges Valley.
2. Draw a sketch-map of the Dry Belt showing separately the parts producing most rice and those producing most wheat. How do you explain this distribution of crops?
3. Give an account, with sketch-maps, of irrigation in the Upper Ganges Valley.
4. Draw sketch-maps from memory illustrating the position of Cawnpore, Allahabad, Delhi and Saharanpur.
5. Describe a journey from the Himalaya Mountains to the Central Indian Plateau.
6. Find another natural region in the world like this one.
7. Compare a day in the life of a villager living in the natural region with a day in the life of a villager living in the Himalayan Region.

CHAPTER XVIII

THE MIDDLE GANGES VALLEY [1]

1. In the last chapter we learnt of the dry regions of the Upper Ganges Valley, where the rainfall is less than 40 inches in a year and where irrigation is necessary for the proper growth of most crops. We learnt, too, that everywhere in that region wheat and barley together, and usually wheat alone are more important than rice. In the next chapter on the Deltas Region or the Lower Ganges Valley, we shall learn of a region where the rainfall is everywhere more than 60 or 70 inches, where much of the land is flooded every year and where rice occupies three-quarters of the total area of crops. In the Deltas Region too, practically no wheat or barley is grown and no millet; the climate is too wet. The region which we are now going to study and which we have called the Middle Ganges Valley lies between the dry region of the Upper Ganges and the very wet region of the Deltas. We find that its characters are between the two, and its crops are a mixture of those most important in the drier regions and those found in the Deltas Region.

2. You learnt in the last chapter that there is no sharp line which forms the boundary of the Dry Region. At its western end the Middle Ganges Valley passes gradually into the Dry Region, and we can take Allahabad or the 40-inch rainfall line as very roughly the division between the two. As we travel from Allahabad down the River Ganges eastwards we find the climate gradually becomes damper, the crops gradually change from those of the dry region to those of the wetter. Although there is a gradual

[1] Comprises nearly the whole of Bihar north of the Ganges and the United Provinces east of Allahabad and north of the river, except a narrow strip in the north belonging to the Terai (Sub-Himalayan Region). A strip of Bihar, south of the river and forming parts of the districts of Shahabad, Patna, Gaya, etc., also belongs to this region.

Fig. 75.—The Middle Ganges Valley. All land over 500 feet dotted; all land over 1,000 feet black. Notice from your atlas the numerous railways in this natural region.

change from one end to the other, the Middle Ganges Valley has certain characters of its own. There are no great canals for irrigation. The rainfall is sufficient and crops can be grown without water brought from wetter regions. We find that in the dry season, when the surface soil gets dry water from wells is used to help the crops, but this 'irrigation from wells' is different from the great system of canals found in the Upper Ganges Valley.

You learnt that the Upper Ganges Valley being a long way from the sea is very hot in the hot season, but fairly cool in the cold season. The Middle Ganges Valley is nearer the sea and does not suffer from such great heat in the hot season. Its rainfall varies from rather less than 40 inches at Allahabad to more than 70 inches in the northern part of Purnea District. When, however, we compare the climate of this region with that of the Deltas Region we find the rainfall is less and the air is much drier. In the Middle Ganges Valley, the cold season which lasts for four months (November to February) is colder than in the Deltas Region and in European houses fires are used. The average temperature for Bihar in December or January is only 61° compared with about 66° at Calcutta in the Deltas Region. The Hot Weather, lasting from March to June, is hotter than in the Deltas Region and the air drier. Hot scorching winds blow down the Ganges Valley from the still hotter regions of North-western India.

The part of this natural region lying south of the River Ganges is somewhat drier and a few small areas have a rainfall of less than 40 inches.

3. Like the Upper Ganges Valley and the Deltas, this is a flat region without any hills and again part of the great plain of Hindustan. It stretches from the Sub-Himalayan on the north to the slopes of the Chota Nagpur Plateau on the south. Near its south boundary is the middle course of the great Ganges river, but the northern three-quarters of the region is watered by numerous streams flowing down from the Himalaya Mountains. The Gogra and the Gandak are the two principal rivers. All the streams bring down quantities of mud and silt and have built up for themselves banks which are higher than the surrounding land. Often during the rainy season they overflow and flood the land on either side. The rivers, too, frequently change their

courses and there are numerous shallow lakes or marshes scattered over the Middle Ganges Valley which represent old, deserted courses of such rivers or lowlying areas between the rivers. But look at Fig. 76 and notice what a large proportion of this region is cultivated—three-quarters of the whole. So we find the marshes are drained and as

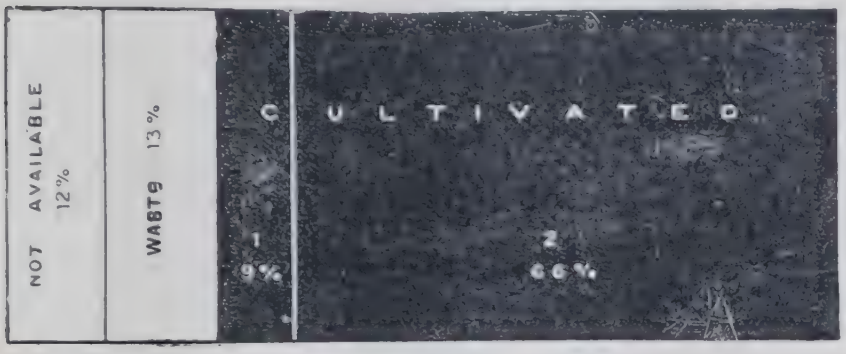

Fig. 76.—Proportion of cultivated land in the Middle Ganges Valley. (1 = fallow ; 2 = sown).

far as possible used for cultivation. Notice from Fig. 76 that there are no original forests left. In the narrow strip south of the River Ganges, the land is drier and marshes are rare. Here the Son and other streams are used for irrigation.

4. Now let us look at the crops grown in this region (Fig. 78). Rice has now become the most important. Wheat and barley are also grown, but in smaller quantity. But millet which is the staple grain in many of the drier parts of India has now almost disappeared and only a very little is grown. Cotton, too, is of very little importance in this region but we find a considerable area is sown with oilseeds (linseed, rape or mustard and sesamum) which are not important in the Upper Ganges Valley.

This natural region used to be the principal indigo region of India. Indigo was grown for the preparation of a dye, but now the dyes are made artificially in factories and the indigo industry is no longer important.

5. The inhabitants of the greater part of this natural region, that is of Bihar, are the Biharis. 'On the whole,

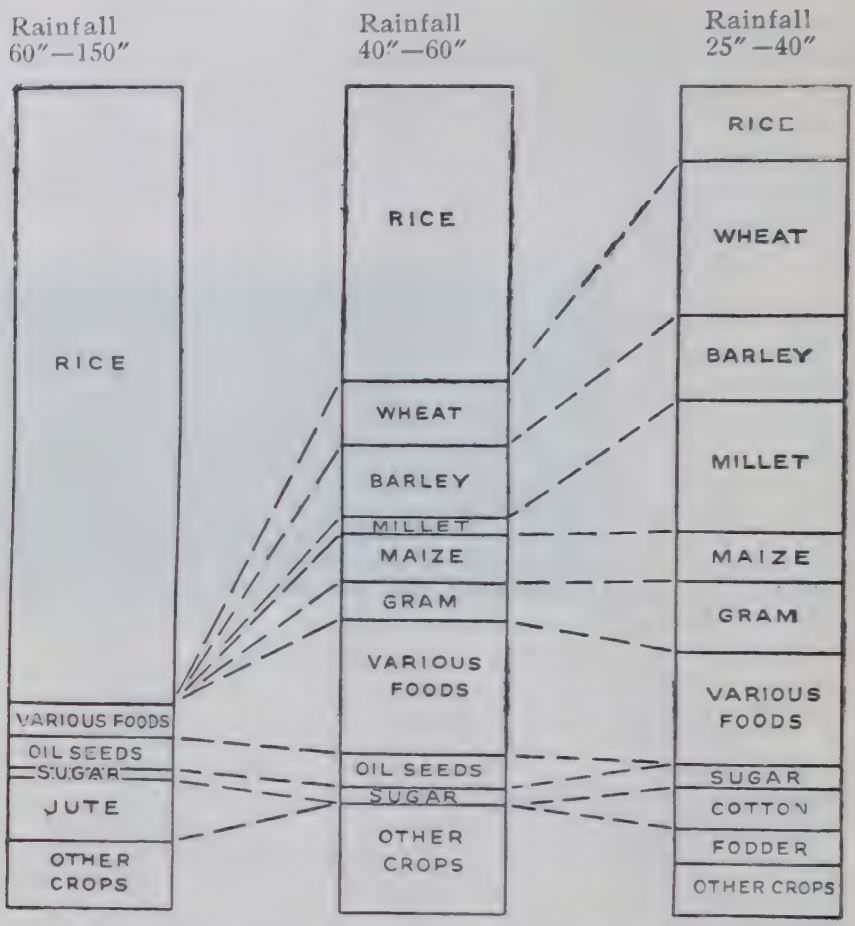

Fig. 77.—The crops of the Ganges Valley—the three main natural regions compared.

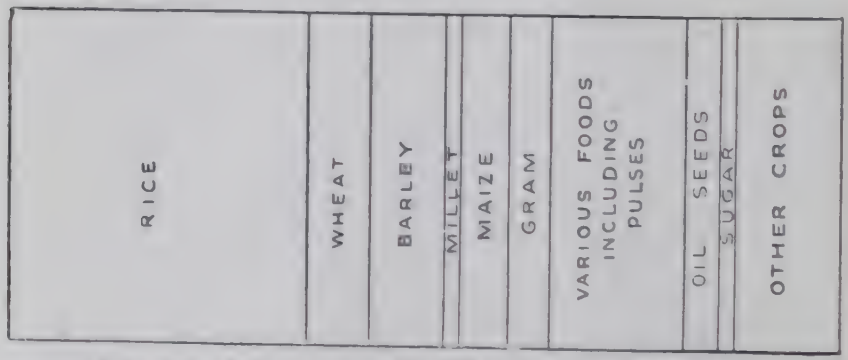

Fig. 78.—The crops of the Middle Ganges Valley.

they are men of slow thoughts but long memories, vigorous and disciplined.' They are somewhat different from the quicker but less vigorous Bengalis of the Deltas Region. They live in a healthier region and so are physically stronger. Like the Bengalis, the Biharis live in small houses in the midst of their lands and not in villages like the people of the Upper Ganges Valley.

The inhabitants of the western borders of this natural region (part of the United Provinces) are Hindus. The language spoken over part of the natural region is Bihari ; in the west Hindi ; but these languages are similar and the form known as Hindustani is spoken or understood over the whole region. Three out of every four persons are engaged in agriculture and only one in every ten in industry. The population working the land is so dense that every year large numbers are compelled to leave their own country and go to other parts of India to work. Many of them go every year in the cold season to work in the mills of Bengal or on the docks of Calcutta, returning to their own homes after four or five months in time to cultivate their land.

There are few large towns in this natural region. Just as in the Upper Ganges Valley there are famous old towns like Benares and Monghyr and more modernized towns which are developing industries like Gorakhpur and Patna.

Benares is the largest town in the natural region, and owes its importance mainly to its being a very sacred place to all Hindus and a great centre of pilgrimage.

Mirzapur and *Fyzabad* are both growing smaller. They used to be very important river-ports, but now the railways have largely replaced the rivers as trade-routes, these towns have lost much of their trade.

Gorakhpur is a great collecting station for the produce of the western part of the natural region and is a notable railway centre. It has developed its manufactures, but is a town which suffers much from plague.

Patna, the head-quarters of the Province of Bihar and Orissa, is second in size only to Benares. Besides being the centre of Government of the Province, it is an important collecting centre for agricultural produce. Patna has given its name to ' Patna Rice ' a very fine kind of rice. The town stretches for a long distance along the banks of the Ganges.

It is south of the river and so connected direct with Calcutta by the East Indian Railway. (See Chapter XXI).

FIG. 79.—The position of Patna (P). Notice its position in the centre of the Middle Ganges Valley just below the junction of four important waterways (1. River Gandak ; 2. River Gogra ; 3. River Ganges ; 4. River Son). It is now a great railway centre. G=Gaya.

Note.—There is no bridge across the River Ganges at Patna.

Bhagalpur is another large town on the south bank of the river towards the eastern end of the natural region.

Monghyr is a famous old town also on the southern shores of the River Ganges, between Patna and Bhagalpur.

Darbhanga is a large and important town in the centre of the rich plains of northern Bihar, and serves as a collecting and distributing centre.

Muzaffarpur is further west in the same region, and is less important. It is the centre of the now dying indigo industry.

Chapra is situated at the junction of the Gogra and Ganges Rivers and used to be a very important river-port, with numerous factories, but it is now getting smaller.

Bihar is a small town some distance south of the River Ganges and on the borders of the Middle Ganges Valley and the Chota Nagpur Plateau.

QUESTIONS AND EXERCISES

1. Compare the climate of this natural region with that of the Upper Ganges Valley and the Delta.
2. Draw sketch-maps showing position and reasons for importance of the following towns :—Darbhanga, Chapra and Patna.
3. Describe the life of a cultivator living in Northern Bihar.
4. Divide the Province of Bihar and Orissa into its natural regions. Draw a sketch-map and describe very briefly the chief features of each region.

CHAPTER XIX

THE DELTAS REGION [1]

1. You will remember that the great Ganges Plain is divided into three parts by its climate. We have studied the Upper Ganges Valley or Dry Region and the Middle Ganges Valley and there remains now only the Lower Ganges Valley and the Delta. It comprises nearly the whole of the Province of Bengal and includes the lower part of the valleys of the Ganges and the Brahmaputra as well as the Surma Valley Region in Assam. Nearly the whole of this region is a fertile alluvial plain—watered by the Ganges and Brahmaputra with their numerous tributaries and distributaries. For thousands of square miles there is not a hill or even a rock ; the soil is everywhere a fine silt or ' alluvium ' and not a stone is to be found. The region is practically flat ; the rise from the sea towards the north is so very gradual that it cannot be seen. The heavy rainfall makes this region very different from the Upper and Middle Ganges valleys, instead of being dry and brown in the Hot Season the country is always green.

To enable us to study it more carefully we may divide the region into three parts :—

(*a*) The Ganges-Brahmaputra Doab, sloping gradually from the Sub-Himalayan Region in the north towards the Ganges. The usual flat surface is broken by a stretch of low hills, called the Barind, covered with the remains of a former forest. This region is also known as North Bengal. There are numerous silted-up river channels and the rivers even now frequently change their courses.

(*b*) The Old Delta or Central and Western Bengal. Owing to several causes the great delta of the Ganges and the Brahmaputra has moved gradually from west to east.

[1] Comprising the whole of Bengal except Darjeeling, Jalpaiguri, Chittagong Hill Tracts and part of Chittagong ; as well as the Sylhet District or Surma Valley of Assam.

Central Bengal is a land of 'dead and dying rivers'. Formerly the river channels carried water from the Ganges to the sea but now very little water passes through them. The place of river-channels is now often taken by large swamps or 'bils'; many of which have been redrained and form valuable rice land. Near the sea are the Sundarbans —extensive swamp forests which furnish useful timber to the towns further inland. In Central Bengal the country is not as a rule more than 50 feet above sea-level but to

FIG. 80.—The Deltas Region. All land over 1,000 feet black.

the west it gradually rises and passes finally into undulating ground on the borders of the Chota Nagpur Plateau. It is

here that we find the important coalfields of Western Bengal—forming really a small natural region on the borders of the Deltas and the Plateau. (See Chapter XV).

(*c*) The New Delta and the Surma Valley. Here the great rivers are still actively building up their deltas and every year huge quantities of silt are brought down by the Ganges and the Brahmaputra. In the high water season a great part of the area is flooded and a rich deposit of silt spread over the country. In the north-east is a small area of low hills—only having an average height of 40 feet above sea-level—but still important enough to prevent the River Ganges changing its channel to even further east. This region is called the Madhupur Jungle and is still covered with grass or forest. Closely connected is the Surma Valley. In this region, the true Delta, there are few or no roads; bullock carts are useless and nearly all travelling is carried out by boats.

2. In Figs. 14 and 15 of Chapter IV we learned that the temperature of this part of North-eastern India is warmer than that of the drier regions of the Upper Ganges Valley in the cold weather, but it is much cooler in the hot weather. It has, as we say, a 'more equable climate'.

The rainfall of the Deltas Region is everywhere good and we notice that the rainfall increases gradually as we leave the borders of the Chota Nagpur Plateau or the Middle Ganges Valley and go eastwards towards the rainy Eastern Hills Region. Malda on the western borders has 53, Calcutta 60, Dacca 73 and Sylhet 160 inches. Everywhere the rainfall is sufficient for the growth of a rich and luxuriant vegetation and for the cultivation of paddy. Nearly everywhere one sees rice swamps, with here and there a collection of huts with its clump of bamboos, palms and plantains. Now we will look at the three parts into which we have divided the Deltas Region.

3. The Ganges-Brahmaputra Doab or North Bengal. This area stretches from the Terai country or the Sub-Himalayan Region on the north as far as the Ganges River on the south. To the north-east is the narrow Brahmaputra Valley, to the west is the Ganges Valley. It is watered by streams flowing down from the Himalaya Mountains. They are torrents in the wet season, and frequently change their courses (like the Tista has done), but in the dry

season are almost dry. Much paddy is grown, as well as jute. The Barind, a stretch of ground slightly above the general level used to be covered with forest, now it has brushwood jungle with a few trees.

4. The Old Delta. This is a typical delta, but it has been raised by the deposits of silt so that it is no longer covered with flood water in the wet season. The waters of the Ganges no longer pass through the numerous channels, they no longer deposit their load of fertile silt. Instead we find broad swamps called bils. These bils are in many places drained and form fertile paddy land. The most typical part of the Delta is between the Hooghly River and the Madhumati River. In the south are the sundarbans or forest swamps, but the land is gradually being reclaimed and used for growing paddy. Further west is the delta of the numerous streams which flow down from the Chota Nagpur Plateau of which, the Damodar is the most important—and then the land gradually rises towards the plateau ; the soil becomes hard and poor and covered with scrub jungle. But in this extreme western part are found the great coal-fields and ironfields of Western Bengal—Raniganj, Asansol and Jherria, described in Chapter XV.

5. The New Delta and the Surma Valley. Here we have a typical delta, covered by a net-work of rivers, streams and creeks. Every year the land is flooded and fertilized by the silt brought down by the Ganges and Brahmaputra. Boats take the place of carts, there are few roads and few railways. In the rains only the river banks and the artificial mounds covered with houses appear above the water. It is impossible to go from one village to the next, or sometimes from one house to another without a boat or a raft or something which will float. Yet it is a fertile region, producing enormous quantities of rice and jute and inhabited by a dense population. In one place, called the Madhupur jungle, a slightly higher ridge has prevented the great rivers moving still further eastwards. This ridge is covered with grass or forest jungle.

6. Let us now look at the Crops of the Deltas Region. Notice firstly Fig. 81. The ' forests ' which comprise six per cent of the whole area are the Sundarbans—found in the districts of Backergunge, 24-Parganas and Khulna. You will notice that there is more waste land and land not

available than the Middle Ganges Valley or Upper Ganges Valley. This is because of the large area still occupied by

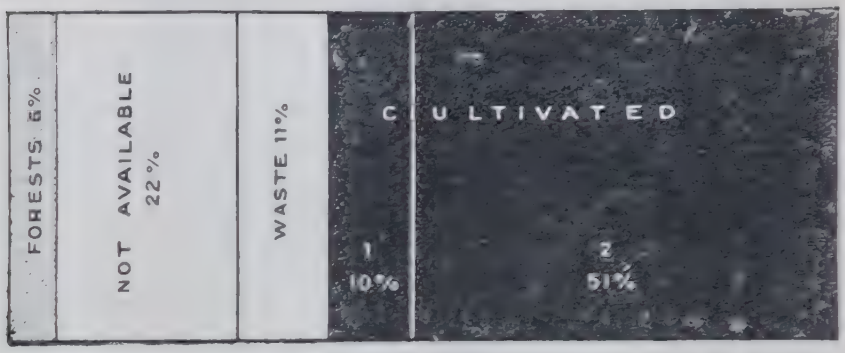

FIG. 81.—Proportion of cultivated land in the Lower Ganges Valley and Delta (1. Fallow ; 2. Sown).

swamps, as well as the waste lands of the Barind, Madhupur Jungle and Western Bengal. Still well over half the whole of the Deltas Region is cultivated. Compare this with the hilly regions. Now study Fig. 82 and again Fig. 77. Rice is by far the most important crop—it occupies

FIG. 82.—The crops of the Lower Ganges Valley and Delta.

practically three-quarters of the whole cultivated area. As we travelled down the Ganges Valley from the dry western region towards the Delta we noticed the wet zone crop, rice, becoming more and more important and the dry zone crops—wheat, barley, millet, maize and gram becoming less and less important. In the Deltas Region the area occupied by wheat, barley, millet and maize is so small that it cannot

be shown on the diagram. A very important new crop appears—jute. Jute is grown for the sake of its strong fibre. Nearly all the sacks and gunny-bags in the whole world are made from jute grown in the Deltas Region. Another important crop is oilseeds—linseed, sesamum and rape.

7. You have learnt that a natural region must have roughly the same physical features and roughly the same climate throughout. Usually this results in the same vegetation and products being found through the region and often too, the same people. The Deltas Region is an excellent example. Everywhere is flat, everywhere the climate is damp. Rice is the principal crop. Throughout this region too, the inhabitants are nearly all Bengalis and 95 out of every 100 people living in the Deltas Region speak Bengali as their native language. The Bengalis are divided into two well-marked groups by their religion, a little less than half are Hindus and about half are Muhammadans. Three-quarters of the people are cultivators and engaged mainly in the production of rice or jute, about 8 people in a hundred are engaged in industry and 5 in trade. Fig. 83 will help you to understand these figures. Naturally

FIG. 83.—Occupations of the people in the Deltas Region.

the people who are engaged in agriculture want to live near their fields and so we find that 93 people out of every 100 live in villages or isolated huts and only 7 people in every 100 live in towns. We learnt that in the dry region of the Upper Ganges Valley the people live in villages consisting of a collection of a number of houses. In the Deltas Region it is quite different. There are really no villages. Each cultivator builds a house or hut in the midst of his fields ; in very wet parts as in the New Delta he must first build a mound on which to place his hut and prevent it from being flooded. Thus the houses or huts

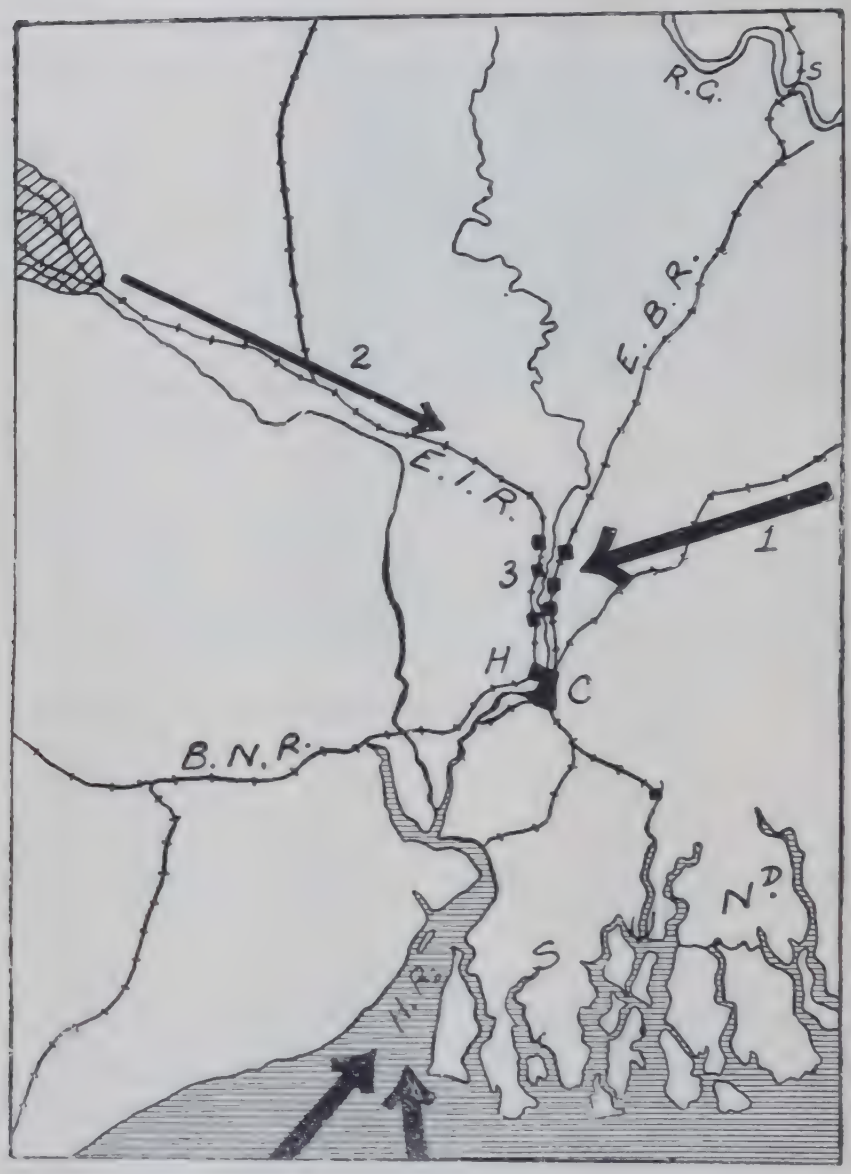

FIG. 84.—The position of Calcutta. (Compare with FIG. 88.) 1 = supply of Jute and Rice; 2 = supply of Coal from the coalfields; 3 = the Jute Mill Towns along the river Hooghly. R. G. = River Ganges with a bridge near Sara (S); H. = Howrah; C. = Calcutta; H. R. = Hooghly River.

are scattered all over the country and most cultivators work their own piece of land.

8. We have learnt that only 7 people out of every 100 live in towns and in the whole of the Deltas Region there are only seven towns with a population of more than 50,000. There are really two classes of towns.

(*a*) The famous old towns of the past, or those which merely act as 'market towns' for the districts, they are old and small and are getting smaller. Murshidabad with 10,000 people is an example.

(*b*) The industrial and commercial towns, which have grown up within recent years around rice or jute mills. All the largest towns belong to this class.

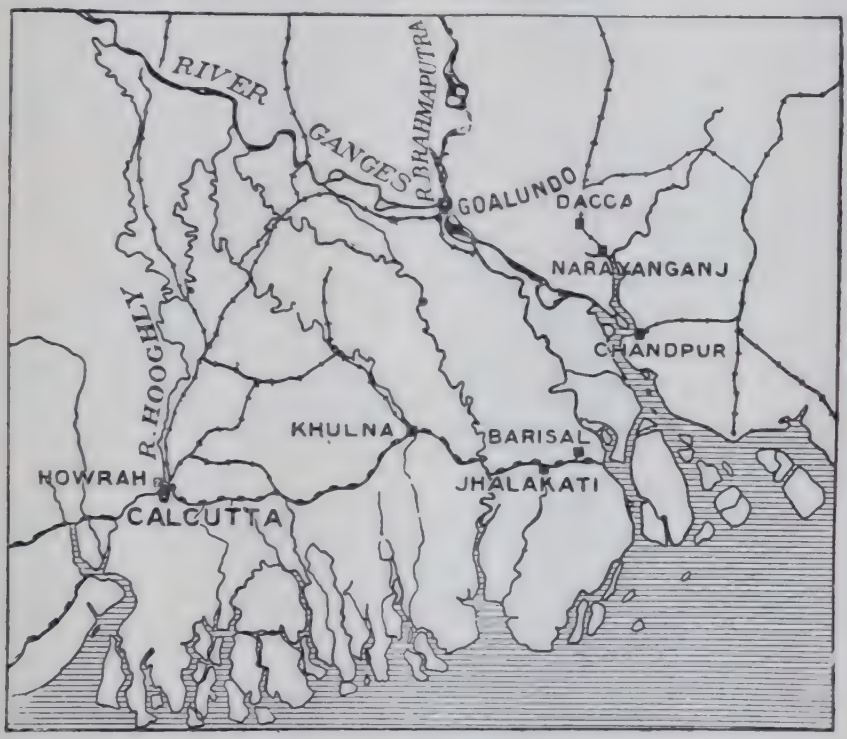

FIG. 85.—Waterways of the Delta. Notice the connection between Calcutta and Barisal by canals, between the Hooghly and the Ganges by a series of channels. Notice how the waterways link up the railways.

Calcutta is the largest city in India and the second largest city in the British Empire. It is only one-sixth the size of

London, but still comes next in size. It was the capital of India until 1912 when the Government moved to Delhi, but Calcutta still forms the 'commercial capital' of India, although over 70 miles from the sea great ocean steamers can reach its wharves by the River Hooghly. Notice very carefully from Figs. 84, 85 and 86 how well Calcutta is situated to receive and export the products of the fertile Ganges Valley behind it. A big port can only grow up when there is a rich and fertile district behind it which can produce goods for export and which has a great population requiring other goods. The district or region behind a port, and for which the port serves as a gate to the outside world is called the 'hinterland' of the port. The hinterland of Calcutta includes the great part of the great Ganges Valley. On the opposite side of the River Hooghly and really forming part of Calcutta is Howrah with nearly 200,000 people. It is from Howrah that the railways start which cross India to Bombay, or go to Madras and Southern India, or up the Ganges Valley. A hundred years ago the site of Calcutta was an unhealthy swamp, it has been made into the largest and one of the healthiest cities of India by the labour of man, and the activities of Government.

Dacca is the second largest city in the Deltas Region (counting Howrah and Calcutta together) and has now over 100,000 inhabitants. It is the centre for the rich agricultural regions of Eastern Bengal or the New Delta. Dacca, unlike Calcutta, was an important city 300 years ago and an old capital of Bengal.

Outside Calcutta and Dacca there are really no big cities or towns. Amongst the largest of the jute-mill or rice-mill towns which are mainly situated along the River Hooghly are Bhatpara, Titagarh and Serampore, all on the River Hooghly. Besides the towns in which manufacture is carried on there are others which act as collecting stations. Narayanganj and Madaripur are examples. To these and to similar places the cultivators of the Delta bring their jute and rice. It is collected and sent to the mills in larger boats.

Jhalakati is one of the important centres of Eastern Bengal and the centre of the betelnut trade.

Sylhet, the centre of the fertile Surma Valley of Assam has only 17,000 people.

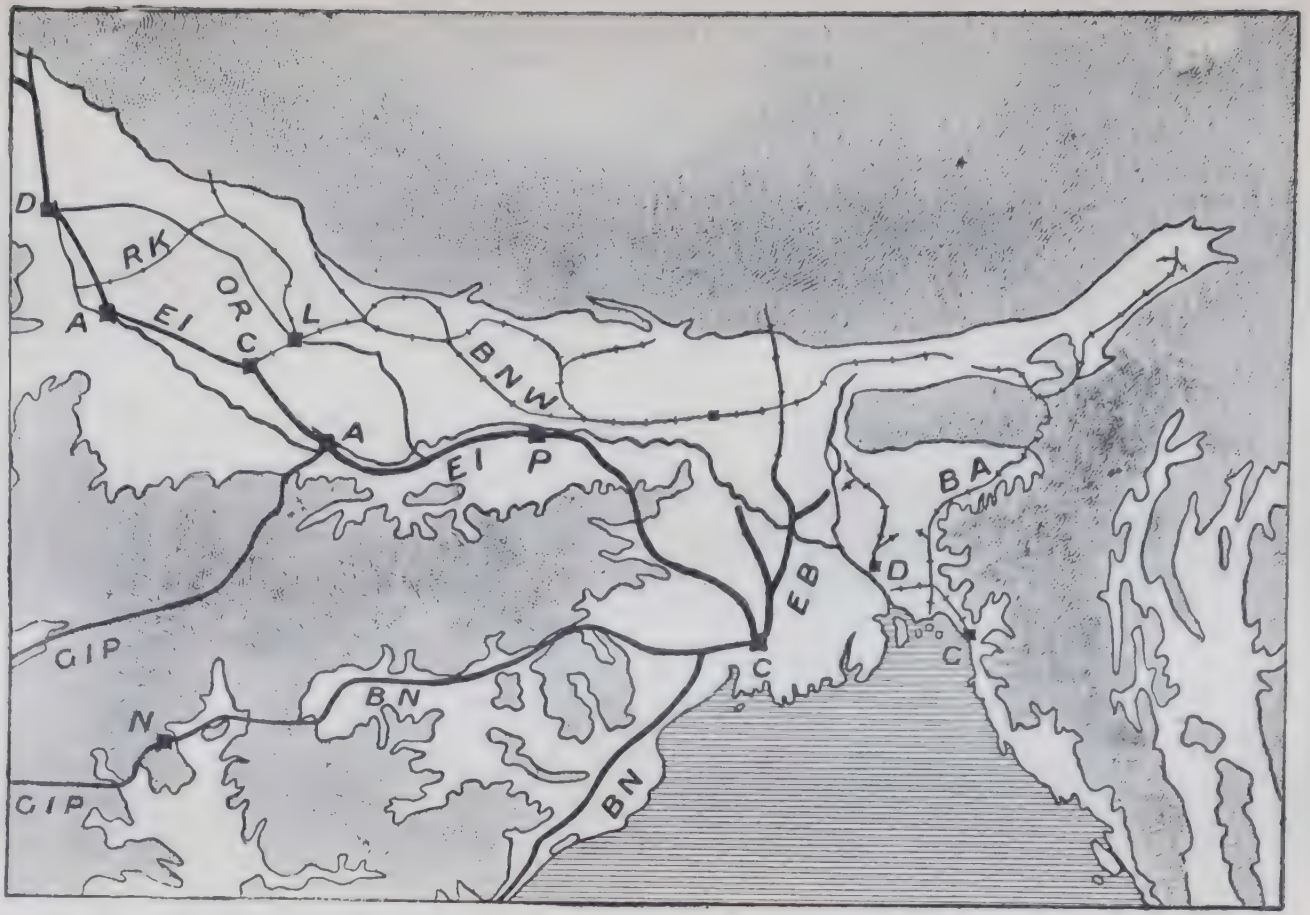

FIG. 86.—Railways of North-Eastern India. Land over 1,000 feet dotted. Heavy lines are broad gauge, small lines with cross bars are metre gauge.

In the western mining region you should notice Asansol and Raniganj, growing centres of the coal trade and railway junctions. These two towns lie outside the Delta proper (see Chapter XV).

QUESTIONS AND EXERCISES

1. Compare the positions of Calcutta and Dacca. Do you think Dacca will ever become as important as Calcutta? Give reasons.
2. What is meant by 'hinterland'? Which has the more important hinterland, Calcutta or Chittagong, and why?
3. In what ways do Central Bengal (Old Delta) and Eastern Bengal (New Delta) differ from one another?
4. Explain why Calcutta has become the most important port of India, although it was once a swamp.
5. Compare the products of the Deltas Region with those of the Upper Ganges Valley. Why do they differ?
6. Describe the climate of Calcutta or Dacca.
7. What is jute? Where is it grown and what are its uses?

CHAPTER XX

THE POLITICAL DIVISIONS OF NORTH-EASTERN INDIA [1]

1. The great Indian Empire is ruled by the Government of India, at the head of which is the Viceroy or Governor-General. The Viceroy is assisted by a small council so that the acts of the Government of India are always said to be by order of 'The Governor-General in Council'. The Viceroy and Council are advised in all matters, but especially in the making of laws, by the Legislative Assembly, a large body of men elected by the people themselves in all parts of the country. Although the Government of India with its Legislative bodies is the real means of Government in India, many matters have to be referred to the Capital of the British Empire, London, where they are administered by the Secretary of State for India. As you will learn from your history, a great part of India used to be controlled by the East India Company. When the possessions of that company were taken over and the Government of India was formed, the Proclamation declared that 'all shall alike enjoy the equal and impartial protection of the law' whatever their race or religion and that all offices in the Government should be open to all natives of India, whatever their race or creed. Education, ability and integrity are the only qualifications required for Government service.

Since 1912 the seat of Government or Capital of India has been Delhi. For many years before that it was at Calcutta.

[1] This chapter is written primarily for the benefit of teachers. In the school curricula of the different provinces there is usually an insistance that a study of the province in which the school is situated shall serve as an introduction to the whole of India. The teacher is advised to work steadily through Chapters I to IX in this book. Thereafter it is better to work through the *whole* of Chapters X to XIX which form a connected whole, but the teacher may, if so desired, select for study just those natural regions falling within the province concerned.

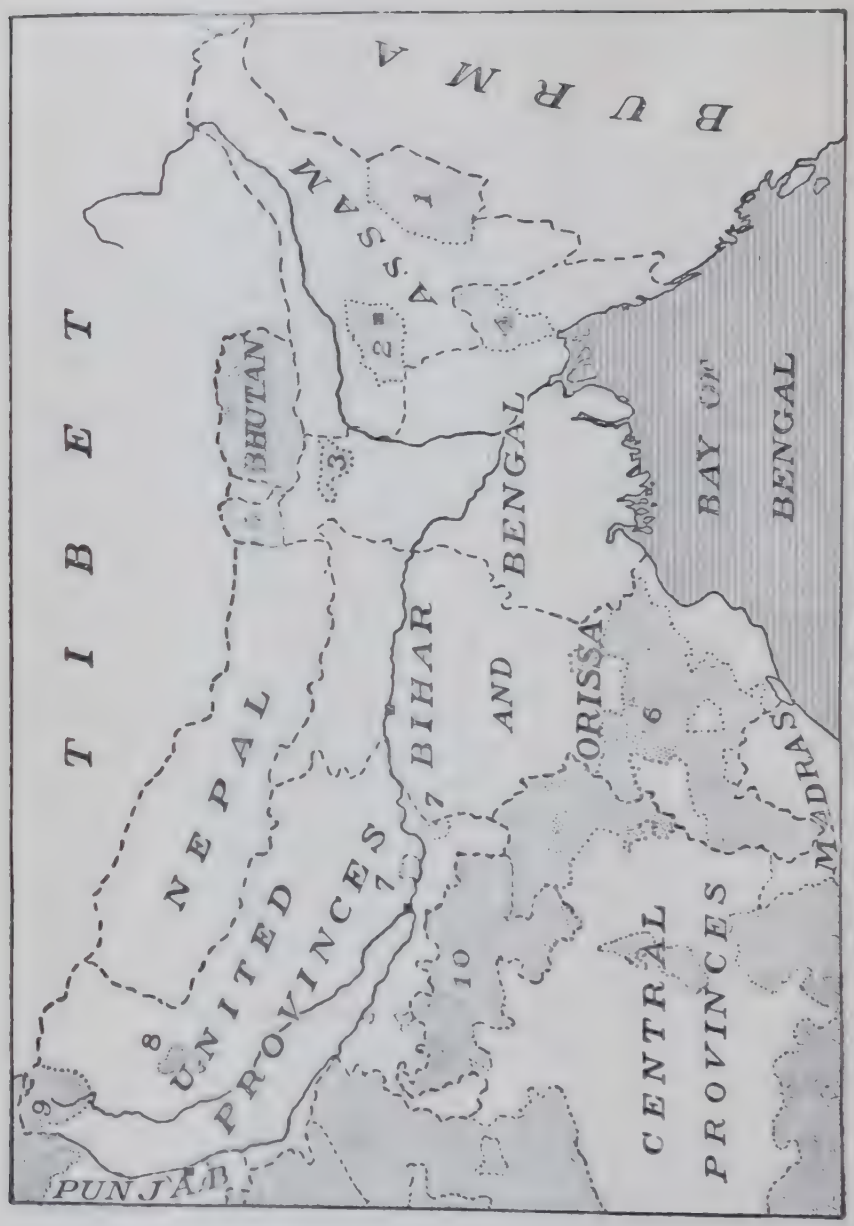

FIG. 87.—Political divisions of North-Eastern India.

Native States dotted :—
1. Manipur; 2. Khasi and Jaintia Hills; 3. Cooch Behar
4. Hill Tippera; 5. Sikkim; 6. Orissa States; 7. Benares State;
8. Rampur; 9 Garhwal; 10. Central India.

2. It would be very difficult to govern a huge area like India from one centre such as Delhi, so the Indian Empire has been divided into nine major and six minor provinces. The nine major provinces of Madras, Bombay, Bengal, the United Provinces, the Punjab, Burma, Bihar and Orissa, Assam and the Central Provinces are ruled each by a Governor assisted by a Legislative Council (elected mainly by the people); the six minor provinces are each administered by a Chief Commissioner.

Then there are large areas of India, called Native States ruled by their own chiefs (styled Maharajahs, Rajahs, etc.). Generally the ruler is advised by a political officer appointed by the Government of India, but the native ruler otherwise has complete control of his affairs. Some of the Native States are very large, others embrace only a few square miles.

Included geographically in India are certain entirely independent States like Nepal. Quite separate in Government is Ceylon, which forms an island off the south of India and only separated from it by a narrow strait.

3. *Assam.* The province of Assam lies in the north-east of the area we have studied in this book. It includes nearly the whole of the Eastern Hills Region (Chapter XII) except a part in the south which forms part of Bengal (Chittagong Hill Tracts and Hill Tippera). The whole of the Brahmaputra Valley (Chapter XIII) lies in Assam. The northern side of the Brahmaputra Valley partakes of the character of the Sub-Himalayan Region (Chapter XI) and shutting in the province on the north is the great range of the Himalaya Mountains (Chapter X). These mountains are so important that all boys and girls in Assam should study Chapter X. The Balipara Frontier Tract and the Sadiya Frontier Tract, now included in Assam, as well as the neighbouring State of Bhutan, both stretch well into the Himalayan Region. In the south of Assam the rich Surma Valley (most of the Sylhet District) really forms part of the great Deltas Region (Chapter XIX).

4. *Bengal.* Practically the whole of the great Deltas Region (Chapter XIX) except the small district of Sylhet in Assam falls within the Province of Bengal. In the south-east the hilly parts of Chittagong, the Chittagong Hill Tracts and Hill Tippera are part of the Eastern Hills

Region (Chapter XII). The extreme west of Bengal borders on the Chota Nagpur Plateau (Chapter XV) and the coalfields really lie on the junction between the Plateau Region and the Deltas Region, where the Plateau slopes down to the Plains. In the north of Bengal is a typical area of the Terai (here called Duars) belonging to the Sub-Himalayan Region (Chapter XI). Most of Jalpaiguri and part of Darjeeling come within this natural region. The remainder of Darjeeling and the whole of the State of Sikkim fall within the Himalayan Region (Chapter X).

5. *Bihar and Orissa.* Orissa forms a small natural region which has been called the Orissa Coastal Strip (Chapter XIV). From there northwards almost as far as the River Ganges is occupied by the Chota Nagpur Plateau (Chapter XV). The part of Bihar north of the Ganges lies almost entirely in the Middle Ganges Valley (Chapter XVIII). In the extreme north-west corner (part of the Champaran District) is a small area belonging to the Sub-Himalayan Region (Chapter XI) and we must remember that this region comprises the southern part of the State of Nepal which bounds the Province of Bihar and Orissa. The great mountain wall to the north is so important that all boys and girls in Bihar and Orissa should learn about it (Chapter X).

6. *The United Provinces of Agra and Oudh.* The whole of the Dry Region or Upper Ganges Valley (Chapter XVII) lies in the United Provinces. East of Allahabad the Ganges Plain belongs to the Middle Ganges Valley (Chapter XVIII). All along the north of the United Provinces lies a strip belonging to the Sub-Himalayan Region (Chapter XI), and in the north-west a large area falls within the Himalayan Region (Chapter X). In the south the country south of the Jumna River forms part of the Central Indian Plateau (Chapter XVI) and in the south-east the district of Mirzapur can be considered as part of the Chota Nagpur Plateau (Chapter XV).

7. *Nepal.* Nepal consists of the two regions, Sub-Himalayan and Himalayan (Chapters XI and X).

CHAPTER XXI

COMMUNICATIONS

1. Having completed the study of the Natural Regions of North-eastern India, we see that they differ from one another in physical features and in climate, and that, therefore, they produce different crops. We have seen how one region is specially suited to the production of a crop required by many of the other regions, as the Deltas Region produces jute for making the bags used in all parts, or the various hilly regions produce timber for building. Also a region may produce a crop grown largely for export to other countries, as the Brahmaputra Valley produces tea. We have now to consider the means by which the regions share their productions with one another, or send them to other parts of India or out of India and get foreign goods in exchange. This chapter, therefore, deals with the means of communication. They are rivers, railways, roads and canals.

2. When goods have to be sent from one place to another, two things must be considered : (*a*) the cost of the journey ; (*b*) whether the goods will suffer damage on the way. Generally speaking, the cost of the journey is by far the most important consideration. The only cost which has to be thought of if things are sent by river is the wages of the men who row or sail the boat. In the case of a railway, the cost is very much more, because a railway costs a very great deal of money to build, and, in addition, there is the cost of the trucks and engines, and the wages of men employed on the line. If goods are sent by road, there is not only the wages of the man who drives the bullocks or horses, but also the cost of the animals' food. A horse can pull about one ton of goods along an ordinary road, but he can drag a boat laden with forty tons along a canal. We can therefore arrange the various means of transport in order of cost, beginning with the cheapest—river, canal, road and railway. When it is important that

goods should travel quickly, then the railway becomes the most important.

3. Looking again at Chapters I and II, we see that North-eastern India is plentifully supplied with rivers, and, owing to the low cost of river transport this was the most important form of communication. Except in parts of the Deltas Region we shall see that rivers are not nearly so important as formerly. The numerous canals of the Upper Ganges Valley are used for irrigation but they are very little used for transport. In England and other parts of Europe the canals are used entirely for transport. There are now numbers of good roads, and the greater part of North-eastern India is covered with a great net-work of railways.

4. From earliest times the River Ganges and its tributary the Jumna as well as the Brahmaputra formed the great highway. Railways have now replaced the rivers to a very large extent. This is particularly the case in the Dry Region of the Upper Ganges Valley. There the water of the Ganges and the Jumna is now more usefully employed in irrigating the land, but as a result there is little water left in the rivers and they are much less used for transport. In the lower part of the Ganges Valleys river transport is still important and in the Deltas Region it is very important. An important river port is Goalundo, near the junction of the Ganges and Brahmaputra Rivers. From there services of steamers run up the River Ganges as far as the United Provinces; up the River Brahmaputra as far as Assam and down the river to Narayanganj and Chandpur. Goalundo is the terminus of the Eastern Bengal Railway from Calcutta. Chandpur is a terminus of the Assam-Bengal Railway and Narayanganj connects with Dacca. Notice then that these steamer services connect up the railway systems which would otherwise be quite isolated.

There is also an important water route between Eastern Bengal where the town of Barisal is an important rice-collecting centre and Calcutta, the vessels making their way through a series of natural creeks, aided by a few artificial cuts or canals (Calcutta and Eastern Canals). In the Deltas Region, especially in Eastern Bengal, in the rains everyone travels by boat. In the New Delta Region

the whole country is flooded—there are no roads and no railways. The vessels are of all sizes; the children row themselves to school in an earthenware jar or pipkin, whilst huge country boats pass by with their loads of jute. There is a little traffic on the Orissa Coastal Canal, and a very little on the Upper and Lower Ganges Canal. Notice from Figs. 68, 80 and 85 the course of these waterways.

5. Roads are of two kinds, 'metalled' and 'unmetalled'. You have probably seen a road being repaired and have watched the workmen spreading broken stones on the surface and then sand, finally a heavy steam-roller crushes the whole surface flat and makes it smooth. A road made in this way is a 'metalled' road, so called because the name given to the broken stone used is 'road metal'. You have seen also the rough roads between villages, dusty in the hot weather, but thick with mud or even covered with water in the rains. No 'road metal' is used for these roads and they are thus termed 'unmetalled'. Metalled roads are expensive to build and keep up. There are fair numbers in North-eastern India; some are kept in repair by the Public Works Department of the Government (P.W.D.), others by District Boards.

There are two very important roads. One is the Grand Trunk Road from Calcutta to Delhi, commenced in 1828–35 before railways were invented. The other is the wonderful mountain road from the plains to Darjeeling.

Bullock carts are the chief means of transport on the roads. There are numerous 'unmetalled' roads between villages all over North-eastern India, except in the Deltas. As their surface is not hard, it quickly becomes full of ruts and the 'roads' become difficult even for bullock carts. The 'roads' in the hilly regions are often mere tracks, wide enough only for pack mules. It is very expensive to construct a metalled road in the plains, for the stone has to be brought from great distances and great care is required to get a good foundation. It is no use piling broken stones on a soft stretch of paddy land. A metalled road must have a good foundation first. In the hills there is plenty of stone, but the roads often have to be made to wind over hills and portions of the hills may need to be cut away before the road can be built.

6. By far the most important means of communication

are the railways. You all know that railway trains run on 'lines'. Perhaps you have noticed if you have been far in India that all the railway engines—and carriages—are not of the same size. The most important thing of all in size is the distance between the two railway lines. If the lines are close together we can only have small engines and small carriages and travel slowly. If the two lines are far apart the engines and carriages can be much larger and can travel much more quickly. The distance between the two rails is called the 'gauge'.

In India there are two very important gauges, and two others much less important. The important ones are :—

(1) The Broad Gauge. The two lines or rails are 5′6″ apart and the engines are big and heavy and the trains can travel very quickly. But the broad-gauge railway is very expensive to build and the trains cost a lot of money to run.

(2) The Metre Gauge. The two lines or rails are one metre or 3′ $3\frac{3}{8}$″ apart. The engines are smaller and the trains are smaller and do not travel so quickly, but they are less expensive to run. The metre-gauge railway is less expensive to build and it has another advantage, the lines can be made to go round much sharper bends and curves than the broad-gauge railway.

Then there are two smaller gauges 2′ 6″ and 2′ which are used for local railways and hill railways.

There are nearly 38,000 miles of railway in India. Nearly half is broad gauge and rather less metre gauge. You should remember that in Europe and a great part of America quite a different gauge is used—called the standard gauge. The rails are 4′ $8\frac{1}{2}$″ apart.

7. You will learn in the next chapter that the whole of the great rich area we have been studying in this book has only two ports—only two outlets to the sea through which goods can be exported and other goods received in exchange. One of these ports, Chittagong, is very small and so Calcutta is really the only important port in the whole region. We can say then that the whole of the great fertile plains of the Ganges and part of the Brahmaputra are included in the 'hinterland' of the port of Calcutta.

We will study now the railways of North-eastern India

in order. Let us take first the railway which serves the port of Chittagong. It is the Assam-Bengal Railway. It is a metre-gauge railway and runs from Chittagong through the fertile Surma Valley, across the Eastern Hills Region into the Brahmaputra Valley. Notice the branch which goes to Sylhet and notice too the important roads which serve as 'feeders' to this railway.

8. Starting from Calcutta are three very important railway systems :—

(1) Eastern Bengal Railway.
(2) East Indian Railway.
(3) Bengal Nagpur Railway.

(1) The Eastern Bengal Railway serves nearly the whole of Bengal, except to the west and north-west of Calcutta. South of the River Ganges it is a broad-gauge railway and there is now a fine bridge over the River Ganges at Sara. But north of the River Ganges nearly all the lines are metre-gauge lines. You will notice from the map how much the railways depend on steamers. The Eastern Bengal Railway is interrupted by rivers in at least five places. There is one piece of the railway called the Dacca Section which is quite cut off from the other parts. The river is too broad to be crossed by railway bridges, it must be crossed by ferry steamers which connect with the trains. Notice too that the Eastern Bengal Railway is a railway which includes both broad gauge and metre gauge. The engines and trains used on the broad-gauge sections cannot of course be used on the metre-gauge and passengers have to change from one train to another at all places where the gauge changes. The Eastern Bengal Railway connects with the little hill railway running up to Darjeeling.

(2) The East Indian Railway provides the great line of communication between Calcutta and the rich Ganges Valley. It is a broad-gauge railway and runs from Calcutta to Delhi and Ambala. Notice that it remains the whole time to the south of the River Ganges but connects with all the great towns—Bhagalpur, Patna, Benares, Allahabad, Cawnpore and Agra. Most of the railways in India are only single lines, so that trains can only pass one another at stations where the line is made double, but the East Indian Railway has a double line the whole way

from Calcutta (Howrah) to Allahabad. The East Indian Railway also serves the coalfields of Western Bengal.

(3) The Bengal Nagpur Railway is another broad-gauge railway. Its main line runs direct from Calcutta (Howrah) to Nagpur and from Nagpur the Great Indian Peninsular Railway runs direct to Bombay. The Great Indian Peninsular Railway is also a broad-gauge railway, so trains run direct without any change right across India from Bombay to Calcutta. A second main line of the Bengal Nagpur Railway runs through Orissa and right down the east coast of India and connects with the railway to Madras.

9. Now we must consider the network of railways which is found in the Ganges Plain north of the River Ganges. In the Middle Ganges Valley Region—that is in Northern Bihar and the eastern part of the United Provinces is the Bengal and North-Western Railway with its great network of metre-gauge lines connecting great towns like Gonda, Gorakhpur and Darbhanga with the river towns such as Allahabad, Benares, Patna and Bhagalpur. The Bengal North-Western Railway collects all the agricultural produce of this region.

In the United Provinces there are several different railways which between them form a network covering the plain north of the River Ganges. The principal ones are the Oudh and Rohilkhand Railway (mostly broad gauge); the Rohilkhand and Kumaon Railway (metre gauge) and branches of the Bombay, Baroda and Central Indian Railway (metre gauge). Running through the Central Indian Plateau is the Great Indian Peninsular Railway, one of the greatest railways in all India. It has a very important line running from Bombay and Central India to Jhansi and then dividing into two branches, one of which terminates at Cawnpore and other at Allahabad.

10. Now let us look at the Railway Time-tables and see what we can learn about the distances between places and the time it takes to travel between them. Suppose we wish to travel by Express Train from Calcutta to Delhi on the broad-gauge East Indian Railway we can leave Calcutta (Howrah Station) at eight o'clock in the evening. When we wake up at five next morning we are at Patna—(330 miles); by midday we reach Allahabad (500 miles) and we shall

reach Delhi at midnight having travelled 900 miles in 28 hours or nearly 800 miles a day. We learnt in Chapter I that big ocean steamers only travel about 300 miles in one day. The great Expresses which run across America from one side of the continent to another can travel 1,000 miles and more in a day.

Now let us make another journey—from Calcutta to Bombay—again on a broad-gauge railway. We can go two ways ; one from Howrah to Nagpur by Bengal Nagpur Railway and the other from Howrah to Allahabad and Jubbulpore (East Indian Railway) and then by Great Indian Peninsular Railway. The first is 1,220 miles, the other is 1,350 miles, but both take about 39½ hours or about 800 miles a day.

If we want to travel from Calcutta to Darjeeling we can go as far as Parbatipur on the broad gauge, then we must change on the metre gauge as far as Siliguri where we change again on to the tiny mountain railway with its two-foot gauge. From Calcutta to Siliguri is 335 miles and takes 14 hours. From Siliguri to Darjeeling is only 51 miles but takes 6 hours.

Let us now take the main line of a metre-gauge railway—the Bengal and North-western Railway from Katihar to Cawnpore. It is only 530 miles but takes 36 hours or only 350 miles in a day.

11. In Chapter II you learnt that India is shut in on the north and east by the wall of mountains. Notice that no railway cuts through this wall. The terminus of the Assam-Bengal Railway is only about 160 miles from Myitkyina, the terminus of the Burma Railways. Yet to go from one place to the other the easiest and quickest way would be to go to Calcutta, then by boat to Rangoon and then to Myitkyina by train—a journey of nearly 2,000 miles in all instead of 160 miles.

We find then, that the railways of North-eastern India are limited (*a*) by mountains and (*b*) by broad rivers. You learnt in Chapter XV and Chapter XVI that the railways follow the easiest routes from the plains on to the plateau.

QUESTIONS AND EXERCISES

1. How would a man travel from Darjeeling to Chittagong ? From Delhi to Dacca ? Why would he travel the way you suggest ?

2. If on an average you can travel 600 miles a day by train, 200 miles a day by motor car, 50 by steamer, and 15 by bullock cart, how long would it take you to reach the following places from Calcutta and how would you go?—Manipur, Shillong, Jhansi, Chittagong.

3. Is there any reason for the direction followed by railways from Calcutta?

4. Draw diagrams illustrating the importance of the position of Chittagong, Asansol, Cawnpore, Jhansi.

5. What is meant by 'hinterland'? Draw a sketch-map of the hinterland of Calcutta.

6. Explain the advantages of improving means of communication and illustrate your answer from what has happened in your own district.

CHAPTER XXII

TRADE AND RELATIONS WITH THE EMPIRE

1. In this book we have now studied the characteristics and products of the natural regions of North-eastern India. We have learned that different parts of the country produce different crops, and sometimes one province grows much more of one crop than it needs and wishes to exchange for some crop or manufactures from another province. In India, then, we have a considerable trade between the different provinces. We must remember, however, that the provinces are only part of the Great Indian Empire and the Indian Empire is a member of a great family of nations, namely, the British Empire, or as it is sometimes called, 'The British Commonwealth.' In this chapter we have to see what part one portion of India plays in the world and the British Empire.

2. First we must understand what is meant by foreign trade. No civilized country produces everything which it requires. The cities of India would seem very strange now without any motor cars, or if we could not buy such things as machinery, glass, fine cotton goods and silks or boots and shoes. These things cannot all be made here, they have to be obtained from other countries. Now nearly all countries can produce more of certain things than they require. Such surplus products can be sent to other countries in exchange. Products which one country sells or sends in exchange to another are called 'exports': goods which the country buys or receives in exchange are the 'imports.'

It is very much better if the exchange of goods is between different countries of the Empire, for those countries stood together in the Great War, and they stand together in peace, and it is by the exchange of goods that they can help one another. India's trade, as we shall see shortly, is mainly with other countries of the Empire.

3. We will now study in particular the things of which the North-eastern part of India produces more than she needs, and so exports or sells to other countries. The whole of the great Ganges Valley and indeed nearly all

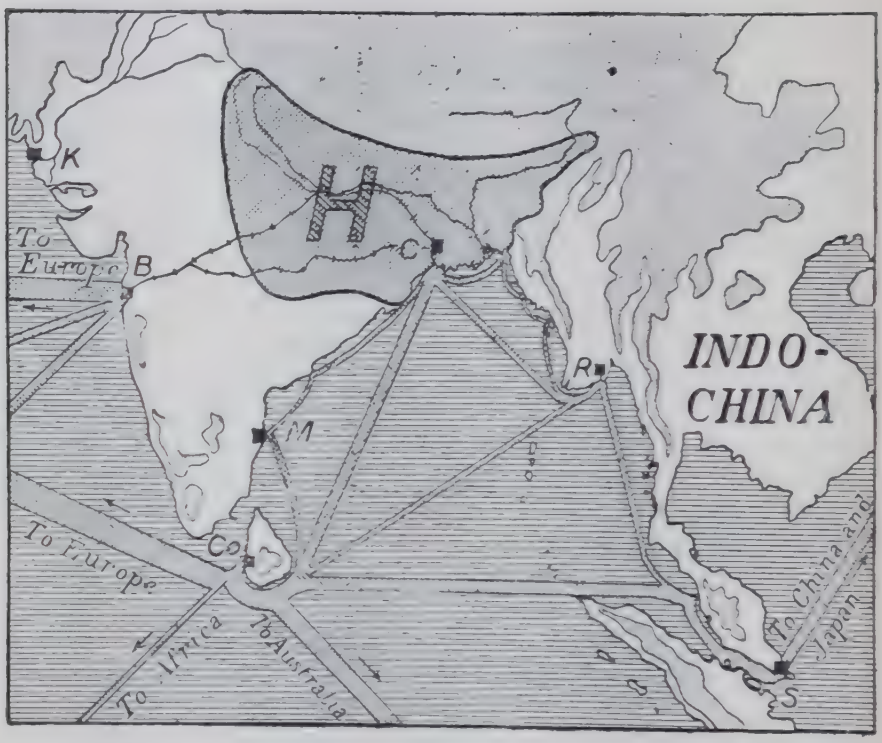

Fig 88.—Trade and steamship Routes to Calcutta.

C. = Calcutta ; B. = Bombay ; K. = Karachi ; Co. = Colombo ; M. = Madras ; R. = Rangoon ; S. = Singapore ; H. = The Hinterland of Calcutta. Land over 3,000 feet dotted.

the area we have studied in this book forms the ' hinterland ' of the great port of Calcutta. There is only one other port—Chittagong—and so we can judge the exports of our part of India by the goods which pass through the port of Calcutta.

(*a*) *Jute and jute manufactures.*—By far the most important export from the port of Calcutta is jute. It is

more valuable than all the other exports added together and in some years is more than twice all the others. Even if we take the whole of India we find jute forms one-quarter of the whole exports. Jute is the cheapest fibre in the world for making bags. It is exported as bags, or as canvas or 'raw' that is ready to be manufactured abroad. The Deltas Region of North-eastern India is the only important jute-producing region in the world and the jute is sent to all countries of the world. Huge quantities go to North America, United States and Canada, England, Germany, Argentine, Australia, Java, China and Japan.

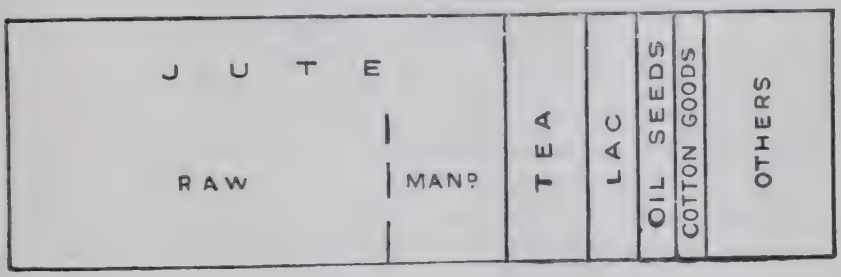

Fig. 89.—The Exports of Calcutta.

Jute is a crop which is largely grown for export and a little less than one-half of the total produced is sent out of the country in its raw state.

(*b*) *Tea.*—Tea is generally the second most important export sent from Calcutta but is a long, long way behind jute. As you have learnt tea comes mainly from the Brahmaputra Valley and part of the Sub-Himalayan Region in Northern Bengal. It is roughly one-tenth of the total trade of Calcutta. More than three quarters of the tea is sent to the United Kingdom. Other countries which buy tea are Canada, the United States and Australia.

(*c*) *Lac.*—Lac is also a valuable export. It comes from the forests of the hilly regions and is sent mainly to the United States (which buys two-thirds of the supply), the United Kingdom, Germany and France.

(*d*) *Oilseeds.*—Oilseeds, including ground-nuts, sesamum, rape or mustard and linseed, are sent mainly to France, United Kingdom and Belgium. Oilseeds are

largely grown for export and about one-fourth of the total crop is exported.

(*e*) *Hides and skins.*—The United States is the most important customer, taking most of the skins, followed by the United Kingdom and Germany.

(*f*) *Grain.*—We have seen what an enormous quantity of rice is grown in the Deltas Region and Middle Ganges Valley. Yet the population is so dense that nearly all the rice is eaten by the people themselves. The same is true of other grains, so that the amount left for export is very small. Indeed in many years Calcutta has to import large quantities of rice from Burma.

(*g*) *Cotton.*—(Raw and Manufactured). Considerable quantities of cotton goods of Indian manufacture are exported, but most of the cotton sent out of India passes through Bombay. Other exports include coal, indigo, opium, metals and oils.

The total value of the exports from the port of Calcutta in 1920–21 was Rs. 1,11,60,81,490 or nearly 112 crores of rupees (not including goods sent to other parts of India). In 1921-22 exports were a little less. Compare this for the total for the whole of India (282 crores in 1920-21). About 40 per cent was with other countries of the Empire, the remainder with foreign countries.

4. Next we must consider the imports or things which India receives in exchange. Taking again those passing through the port of Calcutta, the following are the most important :—

(*a*) *Cotton goods for clothing, etc.*—These are by far the most important and constitute more than one-third of the whole in value. This is despite the fact that India now has important cotton manufacturing industries of her own. About 90 per cent of the cotton goods come from England. During the Great War when it was difficult to obtain goods from Europe many cotton goods were bought from Japan. But Japanese cotton goods are not such fine quality and are not liked so well as the better British goods.

(*b*) *Metal and metal manufactures :—Machinery together with iron and steel and railway engines and railway materials.*—Iron and steel goods, including machinery, are easily second in importance and make up roughly one-quarter of the total in value. The United Kingdom

supplies the greater part, with some from the United States and Germany.

(*c*) *Sugar.*—Sugar is another important import and comes largely from Java.

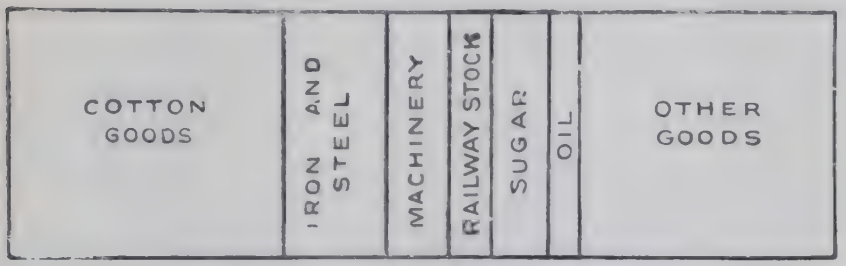

Fig. 90.—The Imports of Calcutta.

(*d*) *Mineral oil.*—The greater part of the mineral oil imported through Calcutta comes from another part of India, viz., from Burma, but the United States also supply large quantities.

Other imports include silk, paper, salt, liquors and motor cars, also timber and rice from Burma.

The total value of the imports through the port of Calcutta in 1920-21 was nearly 120 crores of rupees compared with a total for the whole of India of 382 crores. Nearly 62 per cent came from the United Kingdom, 6 per cent from other parts of the Empire leaving 32 per cent from foreign countries.

5. We have seen in the earlier part of this book that North-eastern India is bounded on the north and east by a mountain wall, and only a very small trade passes by the land frontiers of India. The most important trade is with Nepal. The total value of the overland trade in 1921-22 to Nepal was —

Exports, 249 lakhs. Imports, 591 lakhs.

There is a very little trade with Tibet, Sikkim and Bhutan amounting in all to—

Exports, 40 lakhs. Imports, 132 lakhs.

Most of the trade of North-eastern India is seaborne. Calcutta has 98 per cent of the trade, leaving Chittagong with only 2 per cent. The exports of Calcutta are more important than the imports.

Fig. 91 shows the distribution of trade more clearly.

Look now at Fig. 88 and notice that Calcutta forms the terminus of one of the great ocean trade routes. From Calcutta regular services of steamers go to Singapore and the Far East; Madras, Colombo and Europe; Mauritius, South Africa and South America; as well as direct to Australia. A great deal of money has to be paid to the

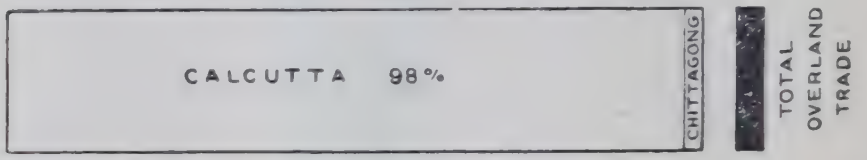

Fig. 91.—Trade of the sea-ports of North-Eastern India (Calcutta and Chittagong) with total overland trade (to Nepal, Sikkim, Tibet and Bhutan) for comparison.

owners of the steamers who carry the goods. If the steamers belong to one of the countries of the Empire that money stays in the Empire and helps to build up trade. In 1921-22 more than three out of every four ships entering Calcutta were British. A large number of the others were Japanese, American, Dutch and German.

6. Railway transport is quicker than water, so that the quickest route for sending goods will be by railway. From Calcutta there are two principal ways of travelling to Europe, one by steamer from Calcutta, the other by crossing to Bombay by train and taking a boat from there. This is quicker than the all-sea route and so letters from England to Calcutta come across France by railway and across India by railway too. A letter to London from Calcutta now takes 17 days on its journey. In the near future we may expect letters brought from England by aeroplanes, in which case much greater speed will be reached, and still more efficiency will be possible in affairs of commerce and communication. Our part of India, especially from Delhi to Calcutta is fortunate in being on one of the main air routes of the world, namely, from Europe to Australia.

At the present time a great deal of commercial business is carried on by means of cablegram and telegram. A message can be sent from Calcutta to any part of the Empire in a very short time in this way and a merchant can get a reply from London by the next day.

QUESTIONS AND EXERCISES

1. From which Natural Region of North-eastern India do you think most of the (1) tea, (2) cotton, (3) lac and (4) jute comes from? Explain why it comes more from this Natural Region than from the others.

2. If you were a merchant in (1) Upper Ganges, (2) Chota Nagpur, (3) Himalayas and (4) Brahmaputra Valley Natural Region what commodities would you try to deal in? Why? (Remember a merchant both buys and sells).

3. Can you foresee any change which may take place in the trade of (1) Chota Nagpur, (2) Brahmaputra Valley and (3) Upper Ganges Natural Region in the future? Explain.

4. If Burma, Australia, United Kingdom, etc. (countries of the Empire) broke away from the Empire and declared war on the rest, how would the people of North-eastern India be affected?

APPENDIX

USEFUL TABLES

These Tables are added with the object of providing the teacher with material for further practical exercises. On no account are they to be memorized merely as facts. The teacher should use his ingenuity to invent exercises and problems upon them, for his pupils to work individually. The ability to work problems of this type is the surest proof that students have really grasped the subject intelligently.

Throughout this book, treatment has been by Natural Regions. In many of the tables which follow the figures are given for the different provinces, so that the pupils may work exercises taking the province in which they live as a whole.

Exercises should be of the following type :—

1. Fill up the blanks in the tables.
2. Represent areas, populations, products and trade graphically on squared paper, and make comparisons between provinces or regions.
3. Draw diagrams for temperature and rainfall like those shown in the book. Explain all differences and make comparisons.
4. Make up and work arithmetical problems on the tables.
5. Take each table separately, turn it into a diagram, then write a composition on all that it teaches.
6. Draw little sketch-maps illustrating facts shown in the tables, especially Table XII.

TABLE I

Sizes and Areas

The Earth : Area 197,000,000 sq. miles. Land 57,500,000 sq. miles. Water 139,500,000 sq. miles

—	Area (sq. miles)	Coastline (miles)
Europe	3,760,000	23,100
Asia	17,040,000	43,900
Africa	11,280,000	19,000
North America	7,950,000	46,600
South America	6,850,000	17,800
Australia	2,980,000	12,100

—	Area (sq. miles)	Population	Density
Great Britain	121,633	45,875,000	
England	50,874	34,500,000	
Wales	7,466	2,125,000	
Scotland	29,797	4,860,000	
Ireland	32,586	4,390,000	
India	1,805,332	318,942,480	
Assam	61,471	7,990,246	
Bengal	82,277	47,592,462	
Sikkim	2,818	81,721	
Bihar and Orissa ...	111,809	37,961,858	
United Provinces ...	112,244	46,510,668	
Burma	233,707	13,212,192	
Central Provinces ...	131,052	15,979,660	
Punjab	136,905	25,101,060	
N.W. Frontier ...	38,919	5,076,476	
Madras	143,852	42,794,155	
Bombay	186,994	26,701,148	
Ceylon	25,300	4,424,000	
Afghanistan	250,000	6,000,000	
China	4,277,000	319,000,000	
Japan	260,700	56,000,000	
Siam	195,000	8,260,000	

APPENDIX

TABLE II

Cloud

The sky is divided into ten divisions, and the number of divisions covered by cloud is shown in this table

Province	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Chittagong ...	1·5	2·2	3·2	4·5	5·4	7·3	7·9	7·8	7·1	4·5	3·0	2·1	4·7
Calcutta ...	1·8	2·5	2·9	3·6	4·7	7·2	8·4	8·4	6·9	3·5	1·8	1·5	4·4
Patna ...	2·1	2·5	1·7	1·5	2·0	5·4	8·2	8·5	6·0	2·2	1·1	1·1	3·5
Allahabad ...	2·5	2·7	2·1	1·9	1·7	4·9	8·0	8·5	5·5	2·0	1·1	1·5	3·5
Delhi ...	3·4	3·4	2·7	2·0	2·0	4·0	6·8	6·6	3·1	0·7	1·0	2·2	3·2

TABLE III

Temperatures (not reduced to sea-level) and Rainfall

Station		Max.	Min.	Average	Rain inches	Station		Max.	Min.	Average	Rain inches
Purnea	Jan.	74·3	48·0		·41	**Puri**	Jan.	80·0	63·6		·28
	Feb.	78·7	51·3		·61		Feb.	83·0	69·0		·77
	Mar.	89·6	60·2		·53		Mar.	86·3	75·2		·51
	Apr.	96·8	69·8		1·32		Apr.	87·9	78·6		·62
	May	95·0	74·2		4·29		May	89·9	80·9		2·66
	June	91·9	77·4		11·00		June	89·2	80·9		7·39
	July	89·8	78·8		14·23		July	87·7	79·8		9·90
	Aug.	89·0	78·5		13·89		Aug.	87·8	79·4		11·12
	Sept.	88·9	77·5		12·16		Sept.	89·0	79·7		9·49
	Oct.	87·6	71·1		2·97		Oct.	89·0	76·8		7·38
	Nov.	82·0	59·0		·19		Nov.	84·8	68·6		3·09
	Dec.	75·8	49·4		·23		Dec.	80·5	62·1		·40
Agra	Jan.	72·8	48·6		·44	**Singapore**	Jan.	86·9	73·0		
	Feb.	77·7	52·2		·33		Feb.	87·9	72·4		
	Mar.	90·1	62·6		·30		Mar.	88·7	73·3		
	Apr.	101·2	73·4		·15		Apr.	88·6	74·6		
	May	106·7	81·5		·42		May	88·7	75·1		
	June	104·4	84·9		2·20		June	88·2	74·8		
	July	94·1	80·9		8·79		July	87·9	74·5		
	Aug.	91·4	79·2		7·20		Aug.	87·4	73·6		
	Sep.	93·2	77·0		4·20		Sept.	87·9	74·0		
	Oct.	93·4	68·0		·68		Oct.	87·9	74·0		
	Nov.	84·7	56·6		·07		Nov.	87·3	73·5		
	Dec.	75·5	49·1		·29		Dec.	85·9	72·6		
Shillong	Jan.	60·6	38·5		·44	**Colombo (Ceylon)**	Jan.	87·6	73·2		
	Feb.	62·1	41·5		·87		Feb.	88·6	73·0		
	Mar.	70·2	50·7		1·94		Mar.	89·7	75·0		
	Apr.	73·8	56·6		4·53		Apr.	89·3	76·2		
	May	74·4	58·8		10·22		May	88·1	78·1		
	June	74·4	63·2		16·36		June	86·1	77·5		
	July	75·7	64·3		13·63		July	85·6	77·1		
	Aug.	75·0	63·5		12·89		Aug.	86·0	77·4		
	Sep.	74·9	62·0		12·97		Sept.	86·3	77·1		
	Oct.	71·7	54·5		6·19		Oct.	86·0	75·3		
	Nov.	66·7	46·3		1·11		Nov.	86·6	74·1		
	Dec.	62·2	39·2		·29		Dec.	86·9	72·9		

Average Temperature of London

	°F.		°F.		°F.		°F.
Jan. ...	38	Apr. ...	49	July ...	64	Oct. ...	50
Feb. ...	40	May ...	55	Aug. ...	63	Nov. ...	44
Mar. ...	43	June ...	61	Sept. ...	58	Dec. ...	40

TABLE IV

Cultivation (in acres) in 1921–22

Province	Forest	Not available for cultivation	Waste : good land not used	Cultivated and fallow
Assam	3,570,000	5,510,000	13,700,000	8,700,000
Bengal	4,270,000	11,530,000	5,800,000	28,700,000
Bihar and Orissa	7,100,000	8,400,000	6,830,000	30,800,000
United Provinces	9,300,000	9,900,000	10,400,000	38,600,000
Delhi	...	71,000	65,000	232,000
British India	85,420,000	153,200,000	151,200,000	274,000,000

TABLE V

Live Stock, etc.

Province	Oxen	Buffaloes	Sheep	Goats	Horses	Mules Donkeys	Camels	Ploughs	Carts
Assam ...	5,000,000	600,000	50,000	750,000	20,000	...	...	1,000,000	50,000
Bengal ...	25,000,000	1,000,000	500,000	4,000,000	125,000	2,000	...	4,500,000	700,000
Bihar and Orissa.	16,000,000	3,300,000	1,000,000	3,000,000	150,000	30,000	...	3,000,000	500,000
United Provinces.	22,000,000	7,500,000	2,300,000	4,000,000	500,000	280,000	20,000	3,300,000	700,000

TABLE VI

Crops Grown (in acres sown) in 1921–22

Add 000 to all figures

Province	Rice	Wheat	Barley	Millet	Maize	Oilseeds	Sugar	Cotton	Jute	Tea	Fodder	Other crops	Total sown
Assam ...	4,517	...	...	...	...	333	41	40	81	318	...		6,277
Bengal ...	21,832	124	83	6	90	1,130	221	48	1,316	177	104		28,161
Bihar and Orissa.	15,220	1,134	1,373	154	1,800	1,670	306	79	109	2	34		31,594
United Provinces.	6,847	6,874	4,355	5,345	2,077	696	1,156	807	...	7	1,267		44,093
Delhi ...	...	52	20	86	3	6	7	2	...	...	19		324
Central Provinces	5,040	2,285	12	2,460	158	1,505	17	1,274	...	...	434		18,694
Burma ...	11,000	69	...	865	233	1,361	35	325	...	54	212		16,620
British India ...	79,700	22,404	7,356	40,115	6,335	12,050	2,363	11,665	1,506	713	8,608		256,582

TABLE VII

IRRIGATION

Province	Area irrigated (in acres)			Percentage of crops irrigated
	By Government canals	By tanks, wells and private canals	Total	
Assam	120		236,811	4
Bengal	179,566		1,764,382	7
Bihar and Orissa ...	992,277		5,528,419	22
United Provinces ...	2,240,216		9,868,509	28
Delhi	26,348		42,017	19
Burma	583,030		1,315,130	8
Punjab	8,997,363		13,293,211	51
Sind				74

TABLE VIII

IMPORTS THROUGH THE PORT OF CALCUTTA. VALUE IN 1920–21

	Rupees		Rupees
Chemicals ...	116 lakhs	Mineral oils ...	388 lakhs
Glassware ...	102 ,,	Paper	232
Hardware ...	312 ,,	Railway stock ...	677
Electrical goods ...	185 ,,	Rubber ...	104 ,,
Instruments ...	239 ,,	Salt	178 ,,
Liquors ...	136 ,,	Sugar	683 ,,
Machinery ...	1,038 ,,	Cotton and cotton goods ...	3,712 ,,
Brassware ...	114 ,,		
Iron and steel ...	1,058 ,,	Tobacco ...	104 ,,
Motor cars ...	491 ,,	Total imports ...	12,200 ,,

TABLE IX

EXPORTS THROUGH THE PORT OF CALCUTTA. VALUE IN 1920-21

	Rupees		Rupees
Coal	148 lakhs	Tea	732 lakhs
Hides and skins.	277 ,,	Cotton, raw and cotton goods ...	205 ,,
Lac	758 ,,	Jute, raw and manufactured ...	6,868 ,,
Metals and dyes ...	161 ,,	Total Exports ...	10,948 ,,
Opium ...	253 ,,		
Oilseeds ...	355 ,,		

TABLE X

IMPORTS FROM BURMA

Value (1921-22) 10,72 lakhs

Rice, mineral oil, lac and timber mainly

TABLE XI

EXPORTS TO BURMA

Value (1921-22) 10,92 lakhs

Coal and cotton goods mainly

TABLE XII

What India sells and What India buys

(All parts of India)

Country	Things India sells	Things India buys
United Kingdom.	Tea, jute, jute manufactures, oilseeds, food grains, hides and skins.	Iron and steel goods, machinery, railway engines, motor cars, cotton goods, liquors and paper.
Straits Settlements.	Rice, cotton, jute ...	Spice and betelnuts, oils, sugar, silk, tin.
Ceylon ...	Rice, coal, cotton goods.	Tea, copra, spices.
Hong Kong ...	Cotton goods, jute, opium.	Silk and silk goods, sugar.
Egypt ...	Rice, cotton, jute ...	Salt.
Mauritius ...	Rice, jute	Sugar.
Canada ...	Jute, tea	Motor cars.
South Africa ...	Jute	...
Australia ...	Jute bags, tea ...	Wheat, coal.
Japan ...	Raw cotton, rice, skins.	Cotton goods, matches, silk goods, glassware, earthenware.
United States ...	Jute cloth, hides, skins, lac, oilseeds, tea.	Machinery, mineral oils, iron and steel, cotton goods.
Java ...	Jute bags, rice ...	Sugar.
Germany ...	Jute, rice, raw cotton, hides, oilseeds.	Dyes, iron and steel machinery, hardware, paper.
Belgium ...	Raw cotton, oilseeds, jute, manganese.	Iron and steel goods.
France ...	Oilseeds, jute, cotton...	Liquors, rubber goods.
Italy ...	Raw cotton, oilseeds, jute.	Cotton goods, metal goods.
Holland ...	Lac, raw cotton ...	Cotton goods, metal goods.
China ...	Cotton goods, jute, tea.	Silk and silk goods, tea.
South America ...	Jute	...

TABLE XIII

Overland Trade

Country	Imports	Exports	Remarks
Nepal	591	249	Value in lakhs of rupees 1921-22
Tibet	55	23	
Sikkim	68	13	
Bhutan	9	4	

TABLE XIV

Proportion of Males and Females (1921) per 1,000 Persons

	Males	Females
Assam	521	479
Bengal	517	483
Bihar and Orissa	493	507
United Provinces	524	476

TABLE XV

Population of Towns and Cities (1921)

1.	Calcutta (with Howrah) ...	1,327,547	14.	Benares ...	198,447
2.	Bombay ...	1,175,914	15.	Agra ...	185,532
3.	Madras ...	526,911	17.	Allahabad ...	157,220
4.	Hyderabad ...	404,187	22.	Bareilly ...	129,459
5.	Rangoon ...	341,962	23.	Meerut ...	122,609
6.	Delhi	304,420	26.	Patna ...	119,976
9.	Lucknow ...	240,566	28.	Dacca ...	119,450
12.	Cawnpore ...	216,436			

The first figure is the position amongst the cities of India.

TABLE XVI

Language

Language	Number of speakers		Where spoken
	Men	Women	
Munda Languages.	1,984,000	1,990,000	Chota Nagpur Plateau.
Tibeto-Chinese Languages. (Bhotia, Lepcha, Naga and many different languages.)	1,000,000	1,000,000	Himalaya Mountains, Eastern Hills Region.
Oriya	4,952,000	5,192,000	Bihar and Orissa.
Bihari ...	4,000	4,000	Bihar.
Bengali ...	25,239,000	24,055,000	Bengal, Assam, Bihar and Orissa.
Assamese ...	895,000	832,000	Assam.
Western Hindi (Hindustani).	50,210,000	45,504,000	United Provinces.

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